FOOD MANUFACTURE

incorporating Food Industries Weekly

NARD HILL LIMITED, 17 STRATFORD PLACE, LONDON, W.1. JANUARY 1, 1951

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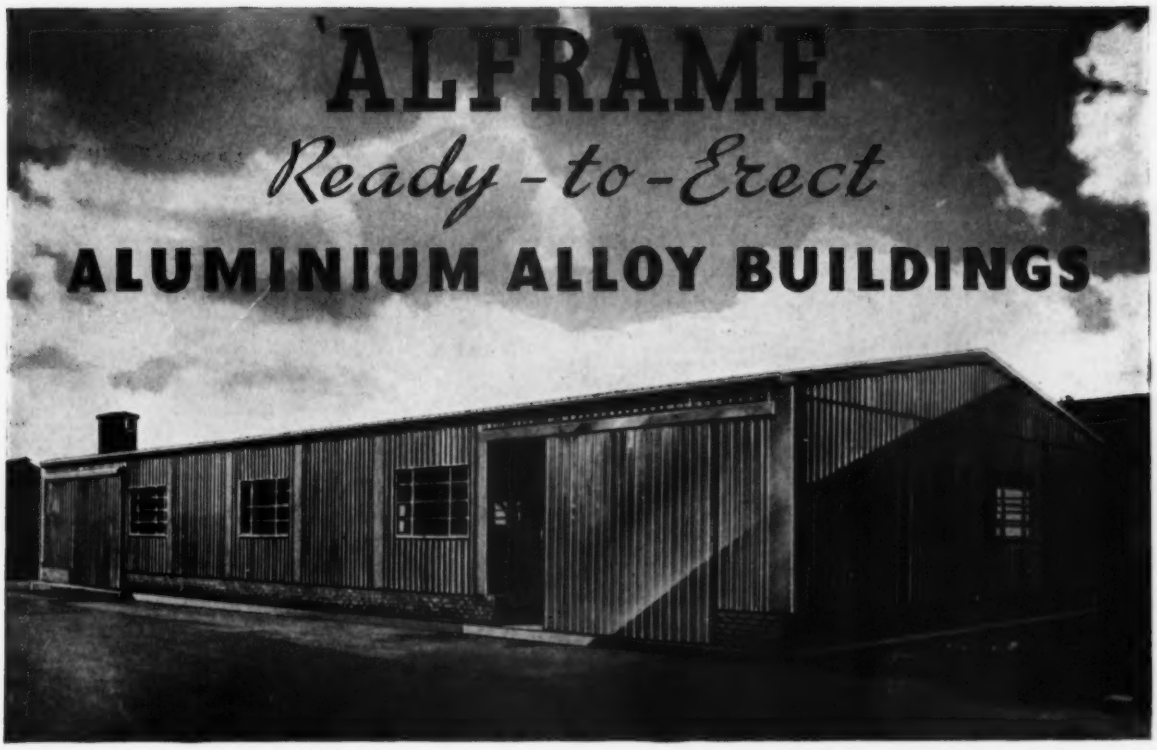

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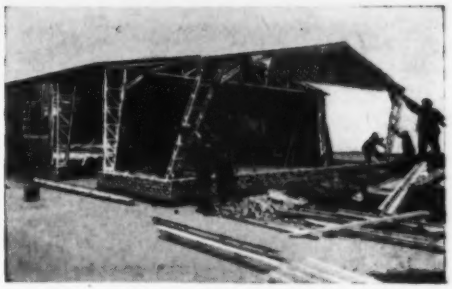

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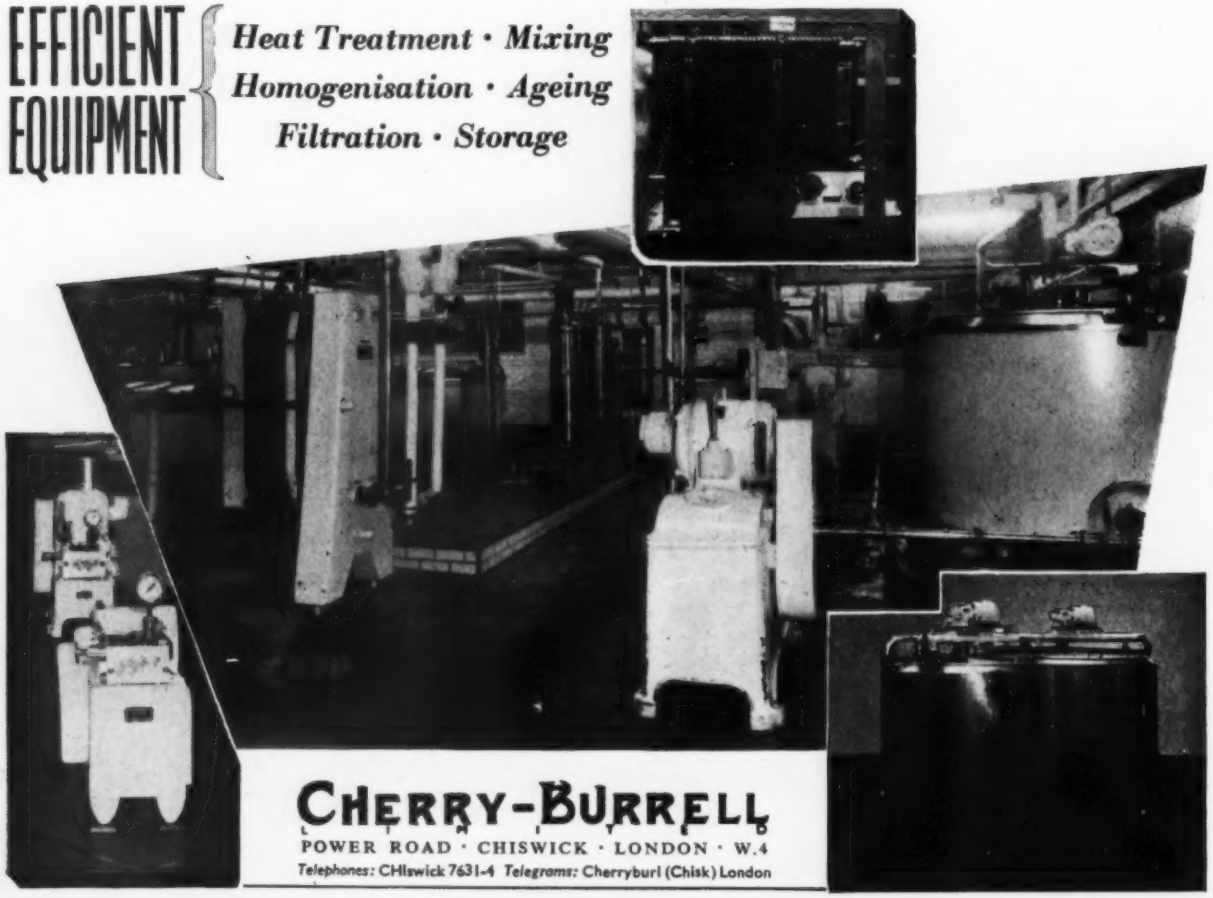
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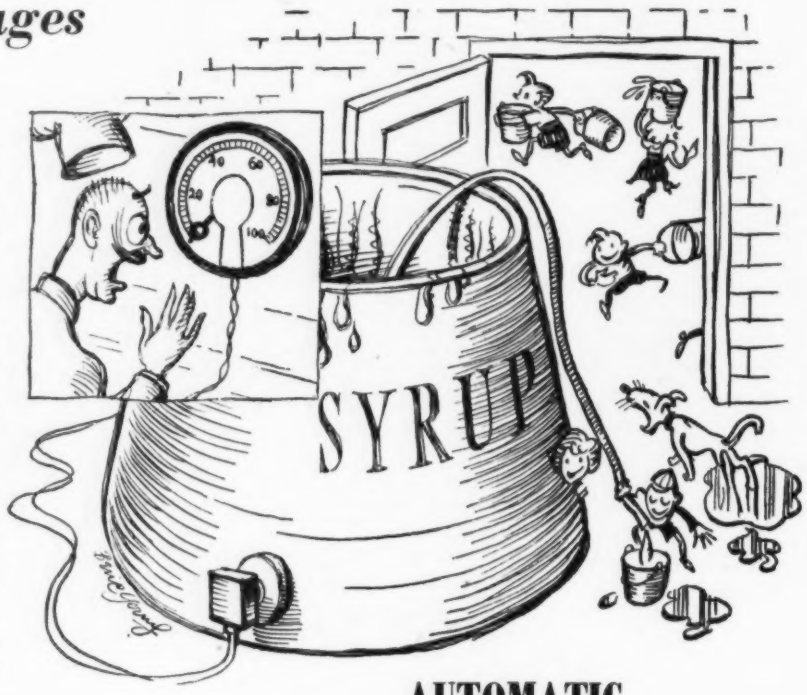

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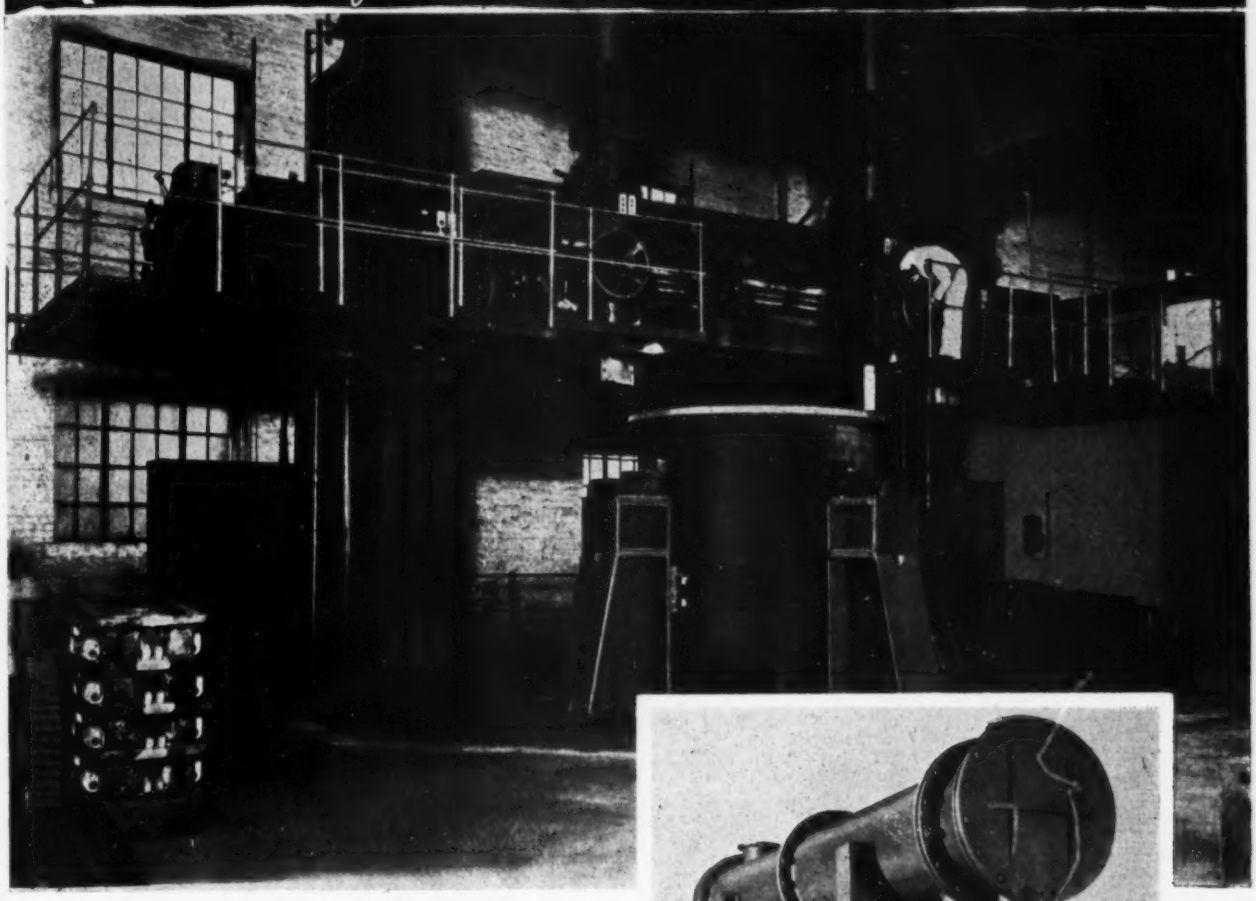

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(1) The upper illustration shows a vertical boring mill recently installed in the Machine shop at Widnes. The table is 18 ft. 5 in. in diameter with a clear height under the crossrail 13 ft. 11 in.

(2) The inset illustration shows a three-tier horizontal heat exchanger in cast iron. Each shell is 20 in. inside diameter and contains 66 copper tubes, 1¼ in. bore by 10 ft. 6 in. in length.

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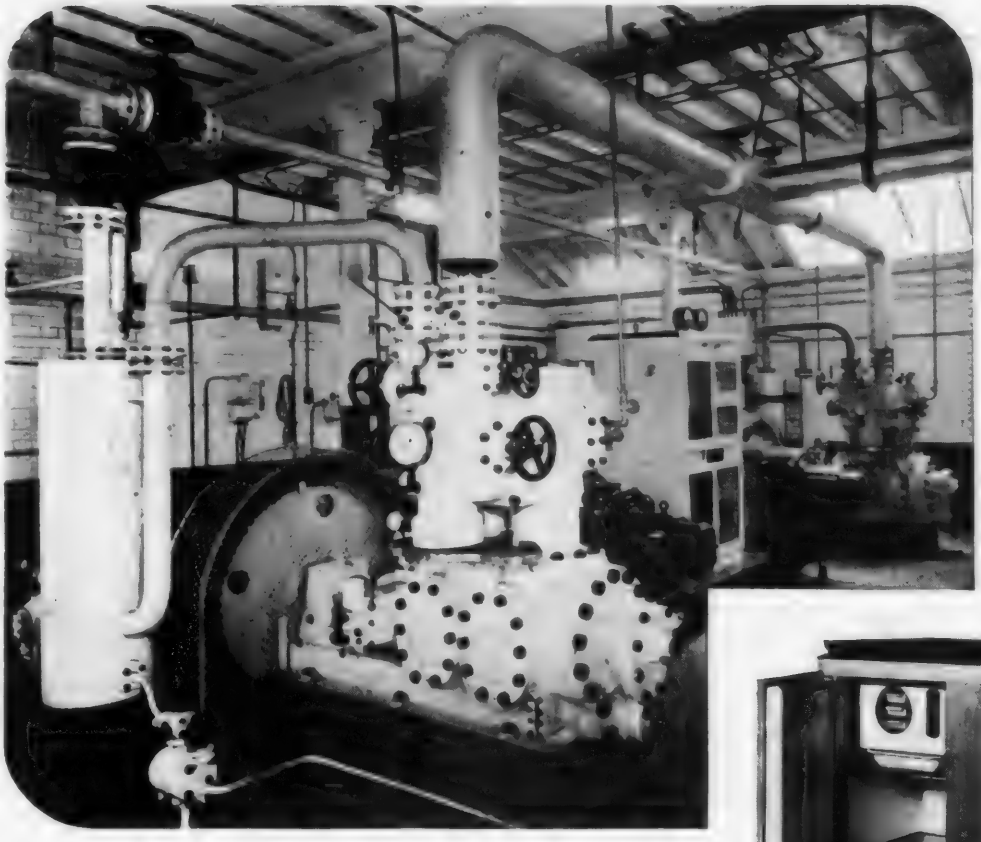

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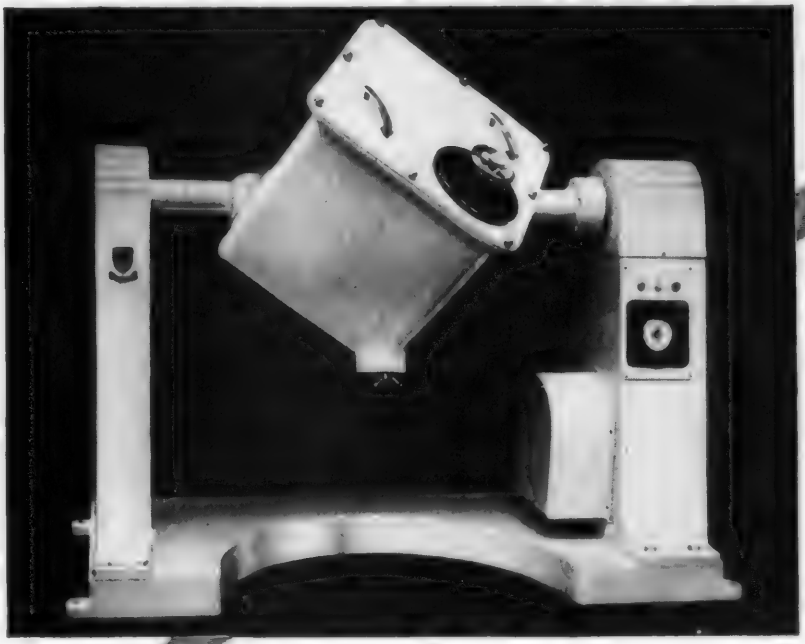

Now you can be sure of a PERFECT MIX—even when ingredients vary widely in densities, proportions, grain sizes.

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For instance, as shown here, empty pie containers are placed on the conveyor, which is flanked by two metal tables, and filling operations are carried out at the speed of the conveyor, so that the pie reaches the end of its journey complete and ready for the oven.

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●Vertical sides to Bins with no Hoppering, giving a clear discharge, avoiding "dead" spaces, and eliminating any possibility of avalanching.

●The motion of the discharging mechanism at the bottom of the bin gives the maximum effect for working and for restarting after a standing period, when the material may have "set." This is accomplished with an extremely low consumption of power. A special Indicator is fitted to show the best stopping point.

●The Discharge is quiescent and regular, the material is not subjected to any violent disturbance, and keeps level over all the bin throughout the process.

●Bins can be arranged in batteries to work together or to give definite proportional mixes.

●With most materials, the Bins do not require any cleaning at all, but if necessary they can be brushed out when empty. Travelling cross bars are arranged to sweep automatically the bottom of the Bin.

●Bins can be closed at the top to guard against condensation or contamination.

●The chains are made with interchangeable links which can be built up in various combinations to suit particular materials, with the necessary strength to meet the duty required.

●The mechanical principles used in the construction are such that the moving cross bars operate with a guillotine action. They are driven very slowly by means of spur gearing.

●Owing to the pull at the commencement of the stroke being specially provided for, the initial force exerted on the cross bars is extremely great. It is largely due to this fact that the driving power required can be kept so low.

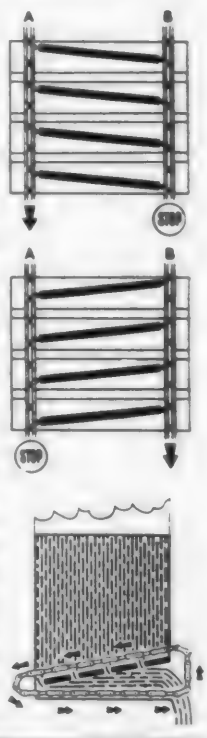
●All the working parts except the chain and cross bars are situated outside the main Bin, and away from the material. The gearing arrangement also lends itself to a very compact and "get-at-able" design.

PRINCIPLE OF OPERATION

The diagram on the right represents the view looking downwards into the bottom of the bin, which is sloped and has several transverse slots through which material can fall. Two continuous chains A and B, connected by steel bars, are pulled alternately through the bin.

While chain A is moving, chain B is stopped and vice versa, so that the steel bars move across the bottom of the bin with a "cheese cutting" effect, taking with them a section of the material, which falls through the slots as it reaches them.

Looking sideways at a section through the base of the bin, it can be seen that the continuous chains pass into the bin again and act as a trailer-conveyor to discharge the material which has fallen through the slots, and is no longer under pressure.



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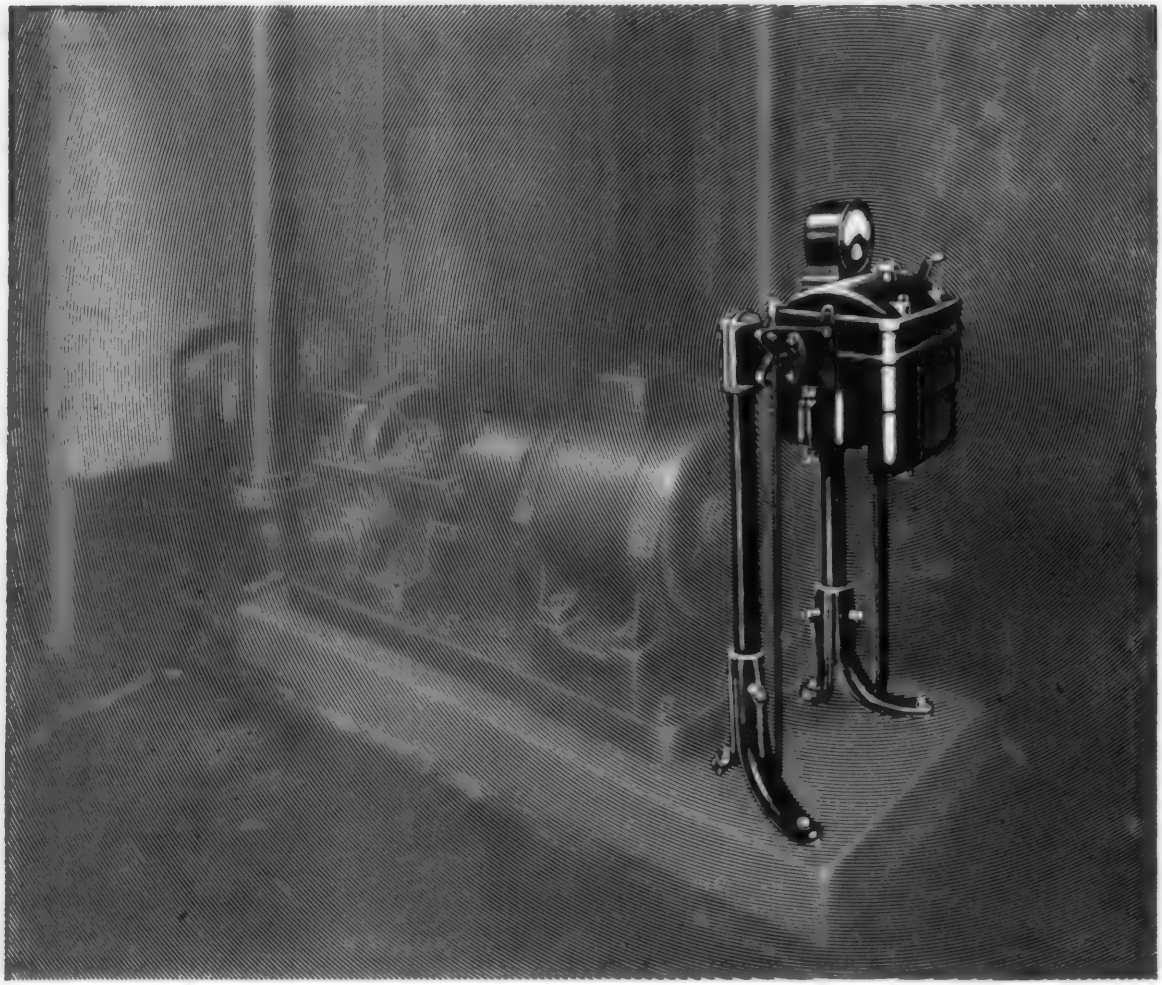

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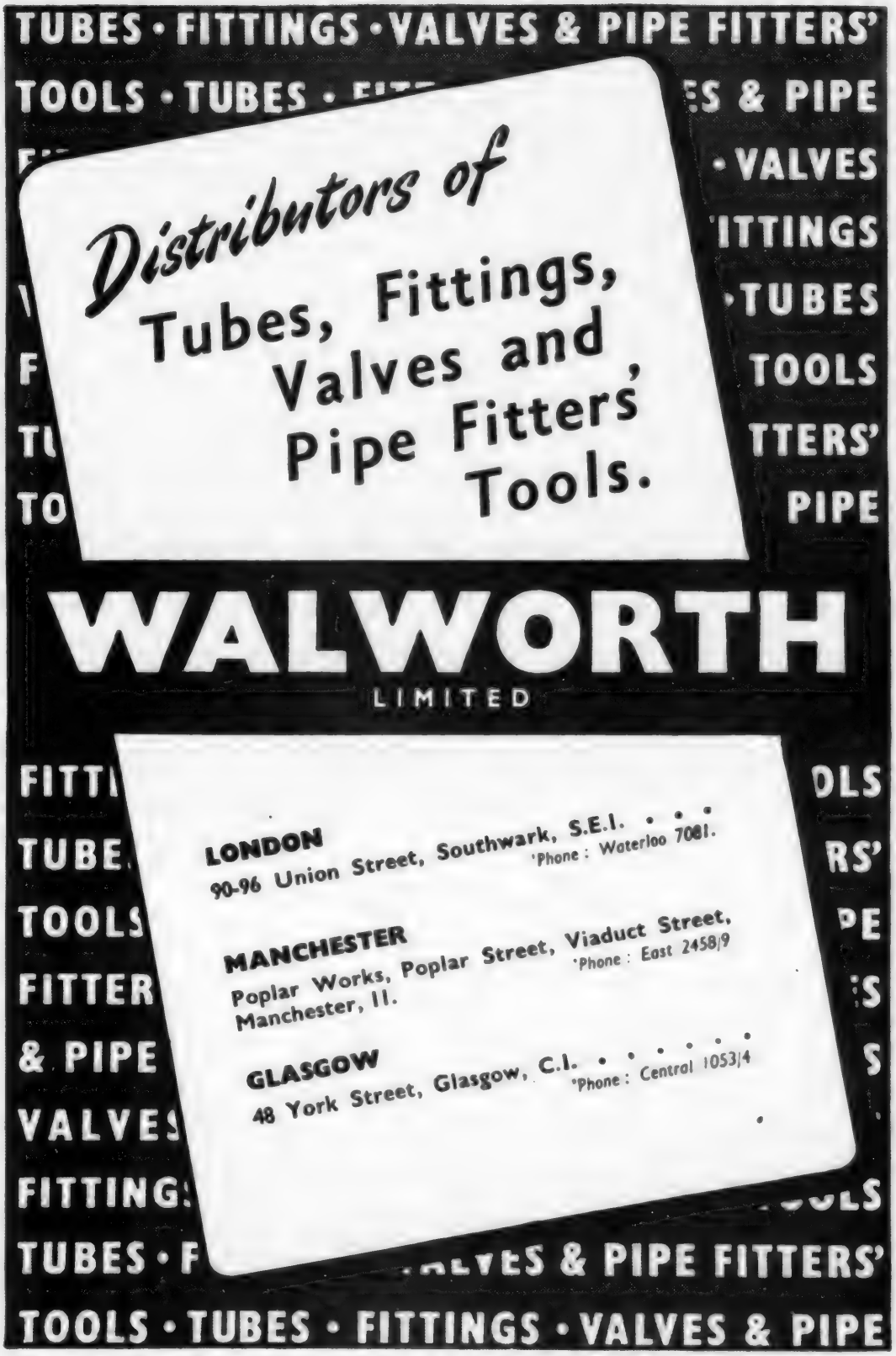
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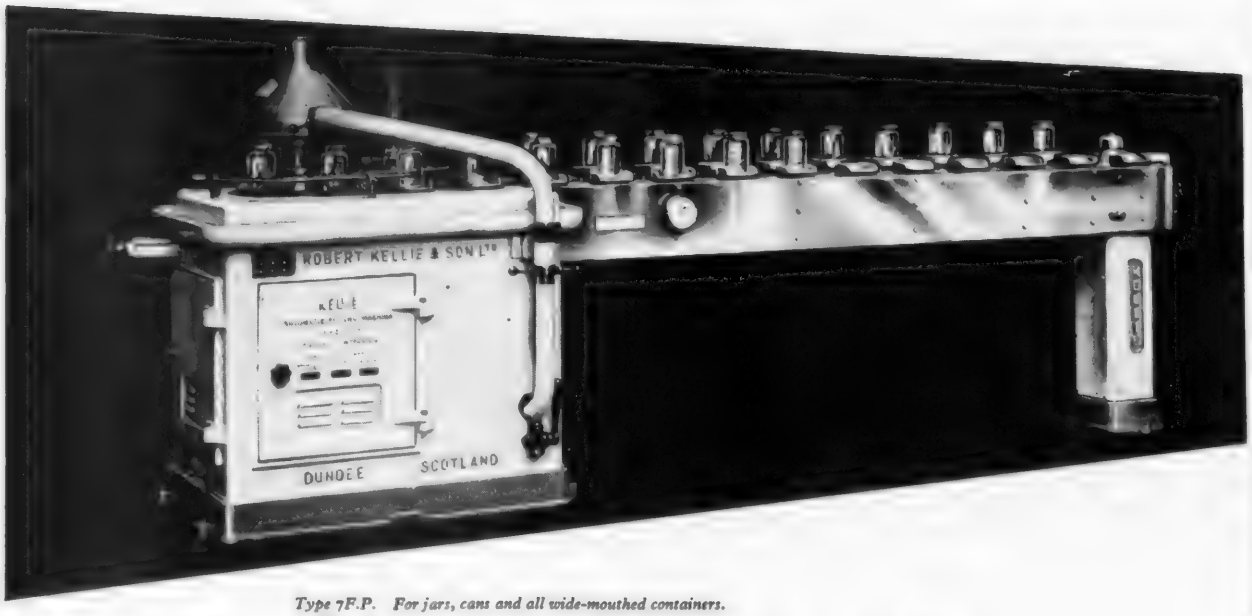

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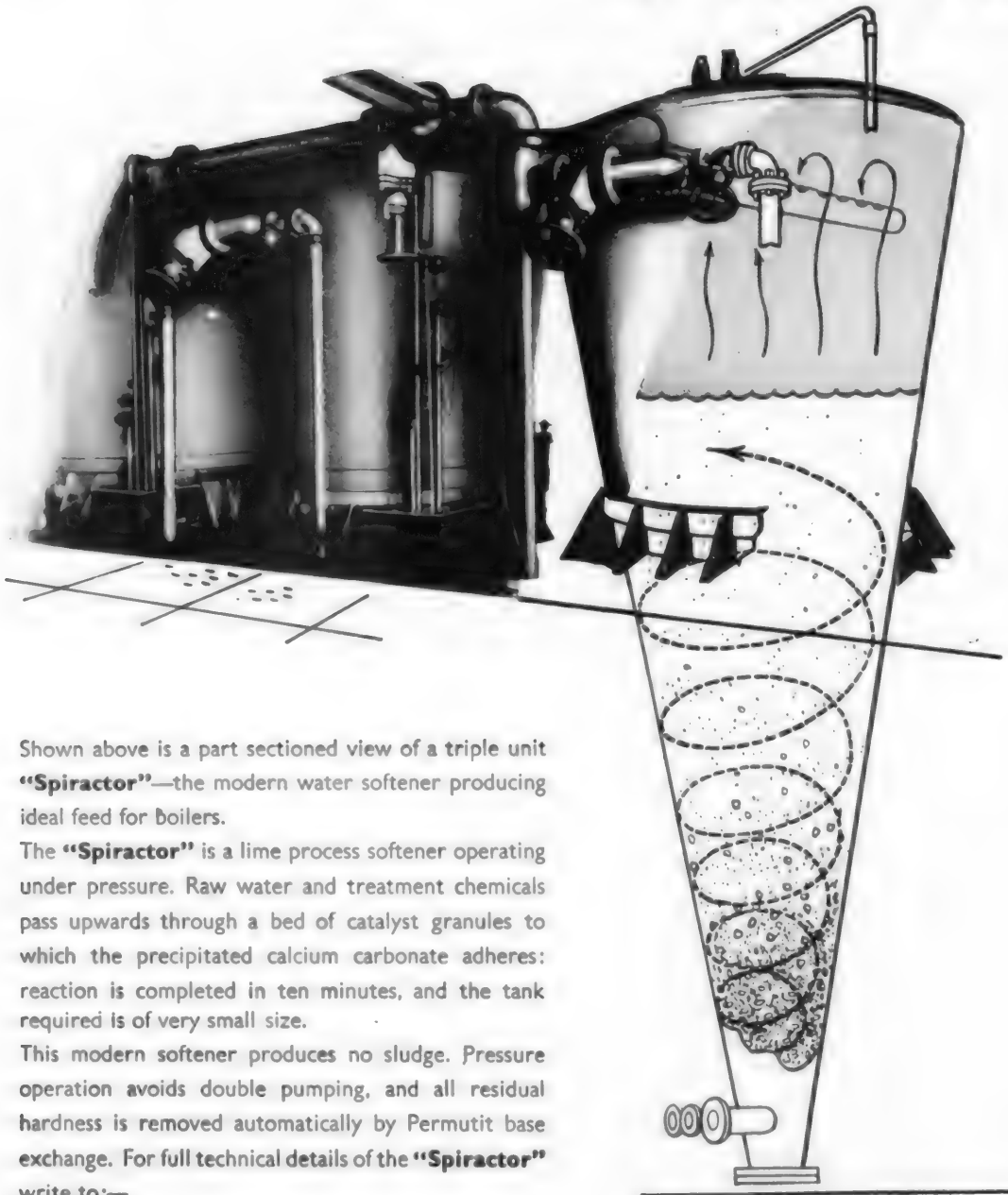

Shown above is a part sectioned view of a triple unit **"Spiractor"**—the modern water softener producing ideal feed for boilers.

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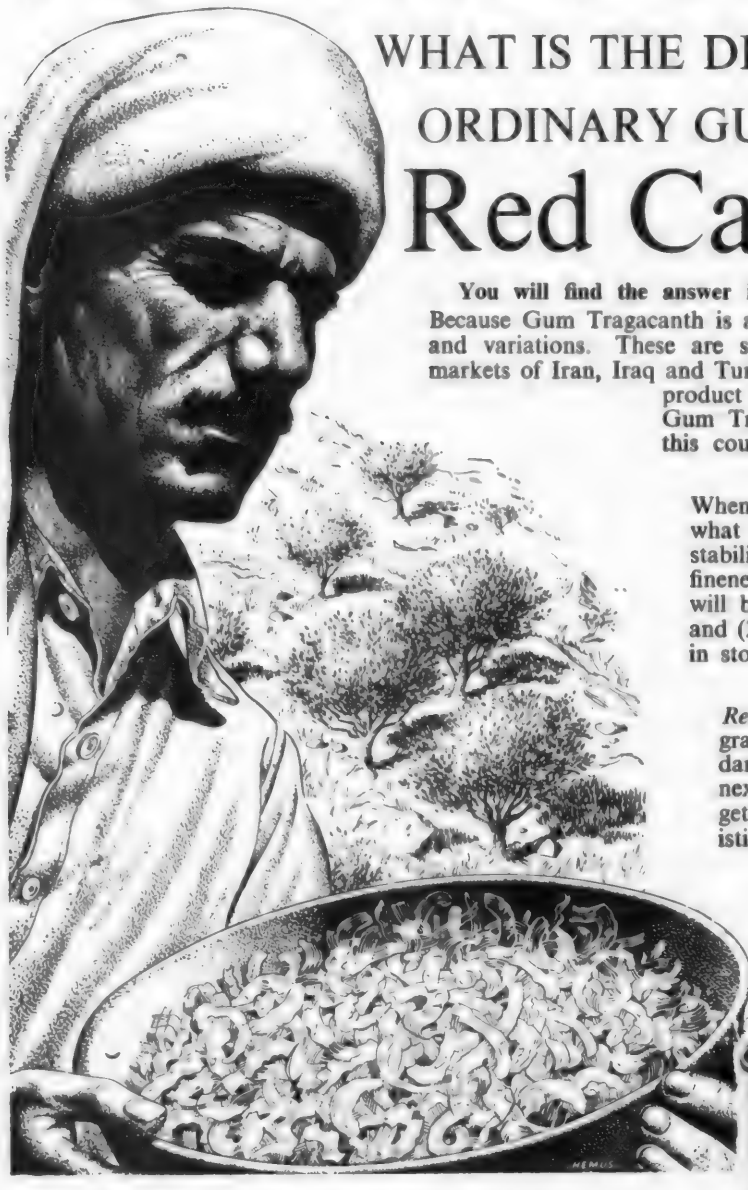

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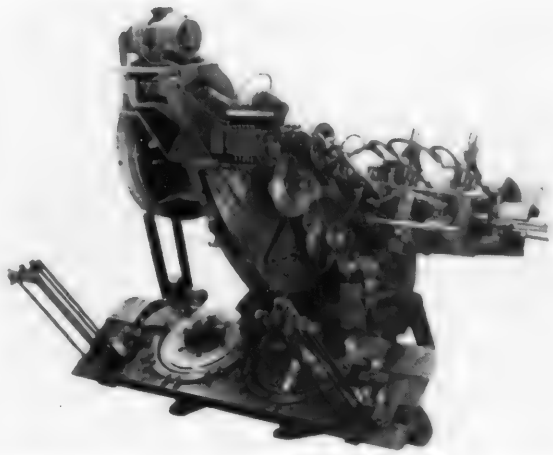

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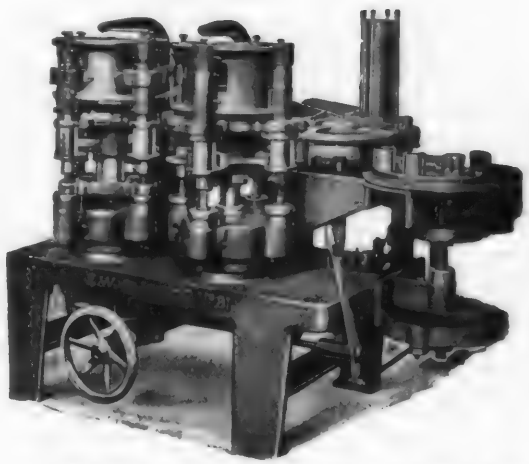

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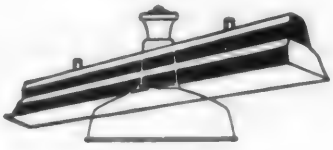

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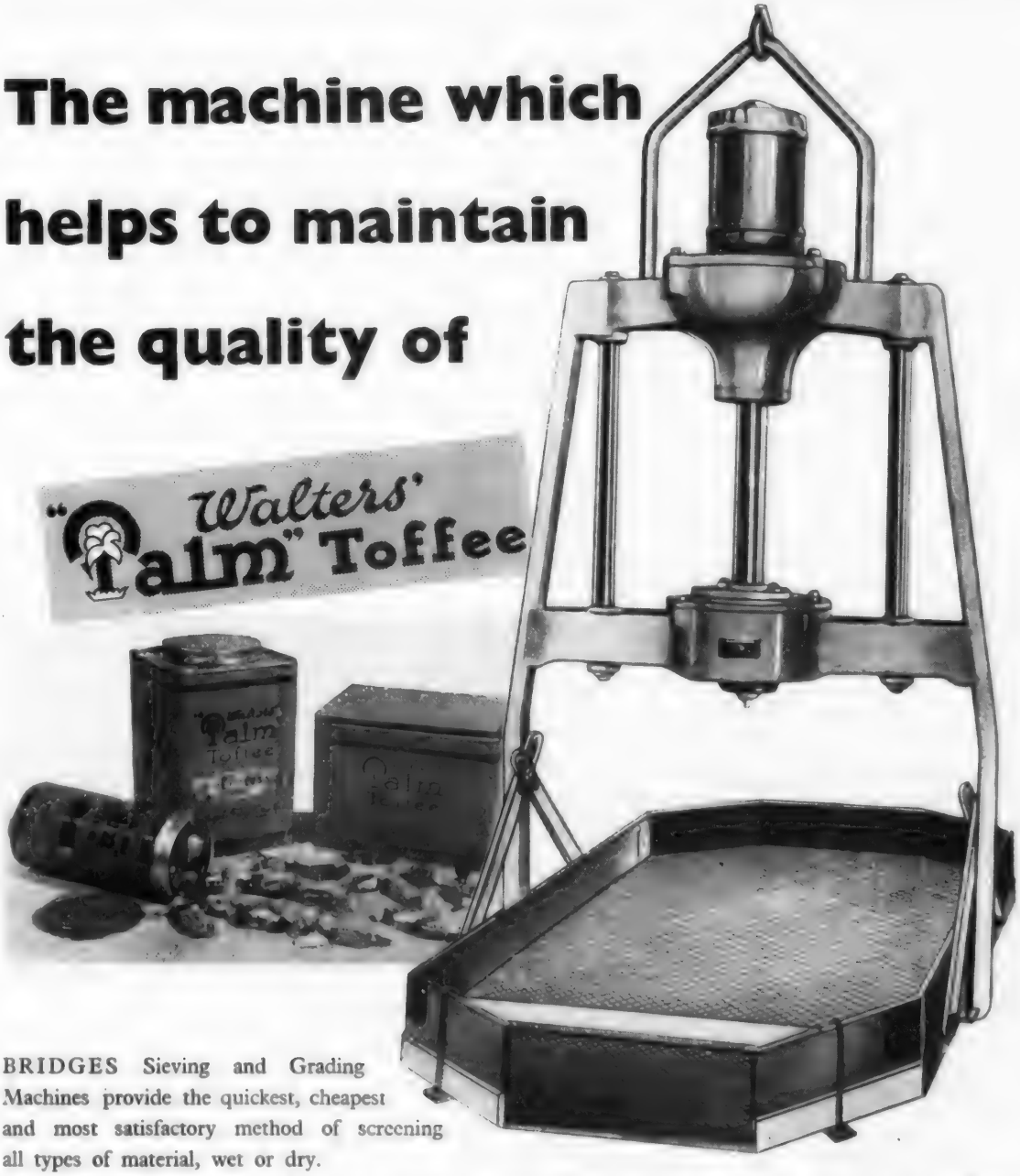

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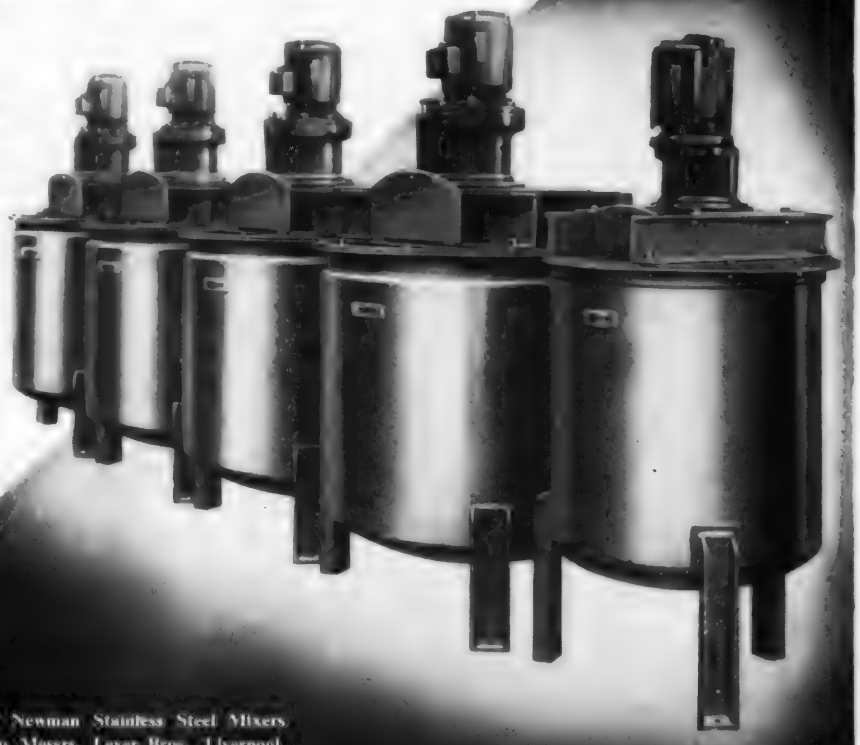

Battery of Newman Stainless Steel Mixers delivered to Messrs. Lever Bros., Liverpool.

NEWMAN INDUSTRIES LIMITED

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Another OSRAM fluorescent installation

Efficient modern Osram fluorescent lighting such as this plays an important part in raising vital output and improving working conditions. And how essential they both are today! All industries can benefit by the ideal lighting conditions created by Osram.

G.E.C. illuminating engineers will gladly check your existing lighting. Expert advice is freely available for new installations.

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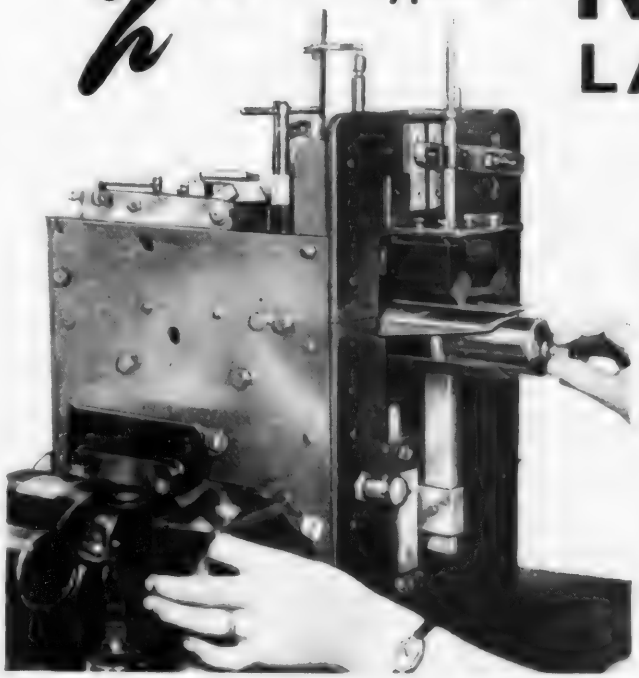
THERE ARE

2 NEW types of NEWMAN LABELLERS



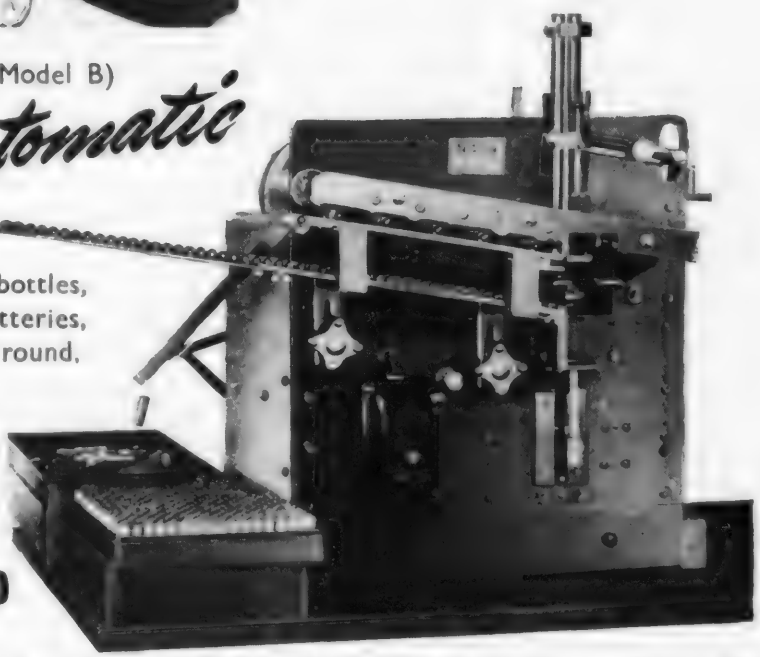
Nº 1 (Model C)

Gums labels completely

Powder Boxes, Cartons and other flat surfaces.

Nº 2 (Model B)

Fully Automatic



Labels, cylindrical objects, bottles, tubes, crayons, ampoules, batteries, etc. $\frac{3}{8}$"-$1\frac{3}{8}$" diam. completely round, or with a gap or overlap.

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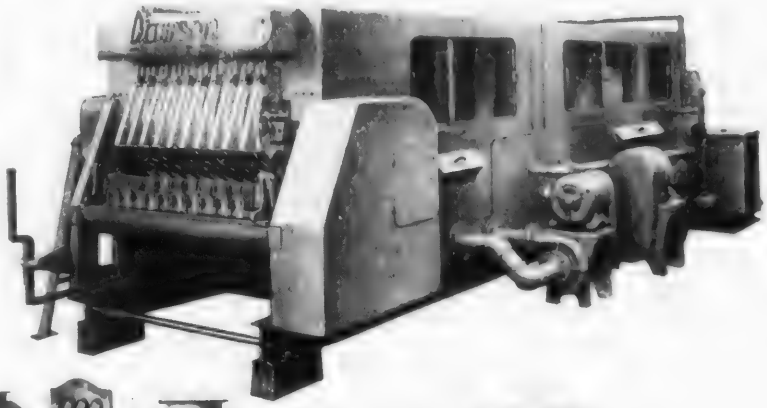
The Hygienic washing of all kinds of Food Containers

1-lb. & 2-lb. JAM JARS are washed and automatically discharged — *sparkling, clean, sterile.*



BAKERS' TRAYS are washed at the rate of 10 trays a minute in this machine which incorporates a steam-heated drying section.

FRESH VEGETABLE CROPS are washed clean before being sent to the Retailers.

The illustrations show but three of a great variety of Dawson washing machines supplied to the Food Manufacturing Industry. Machines are built for washing and drying all kinds and sizes of food containers and the utensils used in making food products. They operate at high speeds and ensure a standard of sterility and cleanliness unobtainable by hand cleaning.

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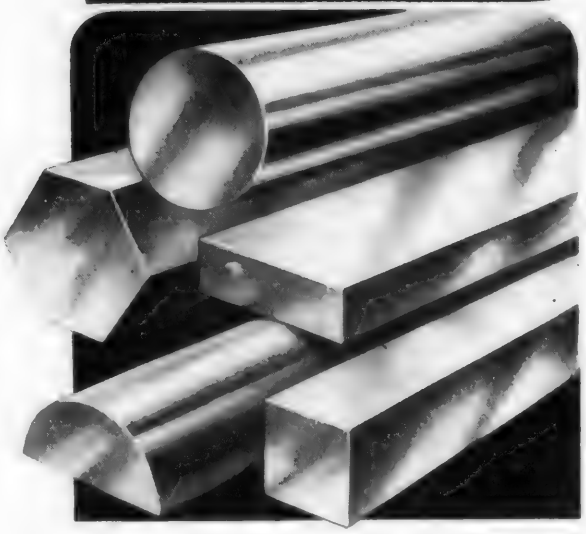

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Manufactured for both heating and cooling duties to maintain a pre-determined temperature without difficulty.

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for the practical man—Information on all processes of production, handling and marketing of milk; the manufacture of butter, ice-cream; cheese, and cream; and; for the dairy farmer, information on the management of his cows.

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BACTERIOSTATIC

(2) If we adopt a single property, *e.g.* a plate count or keeping-quality test, we must recognise that this is quite empirical and arbitrary and leaves untouched other very important aspects of the problem.

(3) The requirements for the quality of milk in the dairy industry are very variable. It is impossible to cater for all these by any one test. If we propose to base the bacteriological control of milk on one test, we should consider the fact that there is an increasing tendency for milk to be delivered to a country depot at anything up to eighteen hours old, there cooled to about 38°F., sent in bulk some distance, pasteurised in a town, again cooled to a low temperature, and distributed to the consumer. The closer we can get our test to take into consideration this chain of treatment the greater will be the commercial use of the control scheme.

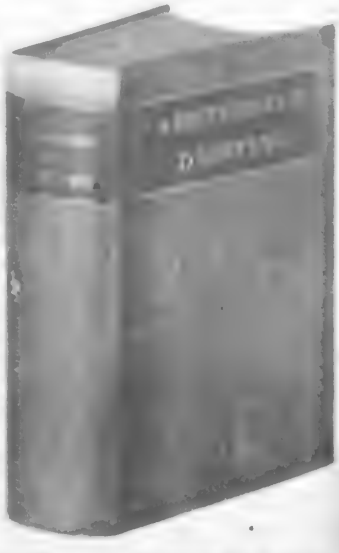
(4) It is suggested that the most important factors in the bacteriological control of milk are (*a*) numbers and (*b*) keeping quality. If we can evolve a practical scheme which covers both these attributes, *e.g.* by adopting simple grading tests for each factor separately, we shall have covered the problem more satisfactorily than by using any one single test, no matter how accurate it may be as a measure of any one of these factors.

If we consider that the use of two tests is out of the question we should then search for the test which gives us the maximum amount of information about the hygienic quality of milk in a broad sense, due consideration being given to the weighting attached to the various components of which hygienic quality is composed.

(5) Under the present testing schemes the following are suggested as reasonable standards: (*a*) On the creamery platform—time to reach disc ½ or 0 or methylene blue reduction time greater than one hour. (*b*) At the pasteurisation depot—as for (*a*). (*c*) In the household—a commercial keeping quality of at least twenty-four hours.

If these standards could be attained, the milk supply of the country could be regarded as satisfactory from the keeping-quality point of view. *See* Clean milk production; Legal aspects; Management of creameries; of pasteurising depots; Methylene blue test; Microscopic count; National milk testing scheme; Plate count; Quality payment; Resazurin test.

Refs.; Chalmers; Wilson *et al.*; Rowlands (1947), *Brit. Med. Bull.*, 5, 196; McClemont, *ibid.*, 201; Anderson and Wilson (1946), *JDR*, 14, 21 (resazurin and *MB* compared); Barkworth *et al.* (1941), *JDR*, 12, 265 (plate count and methylene blue test).



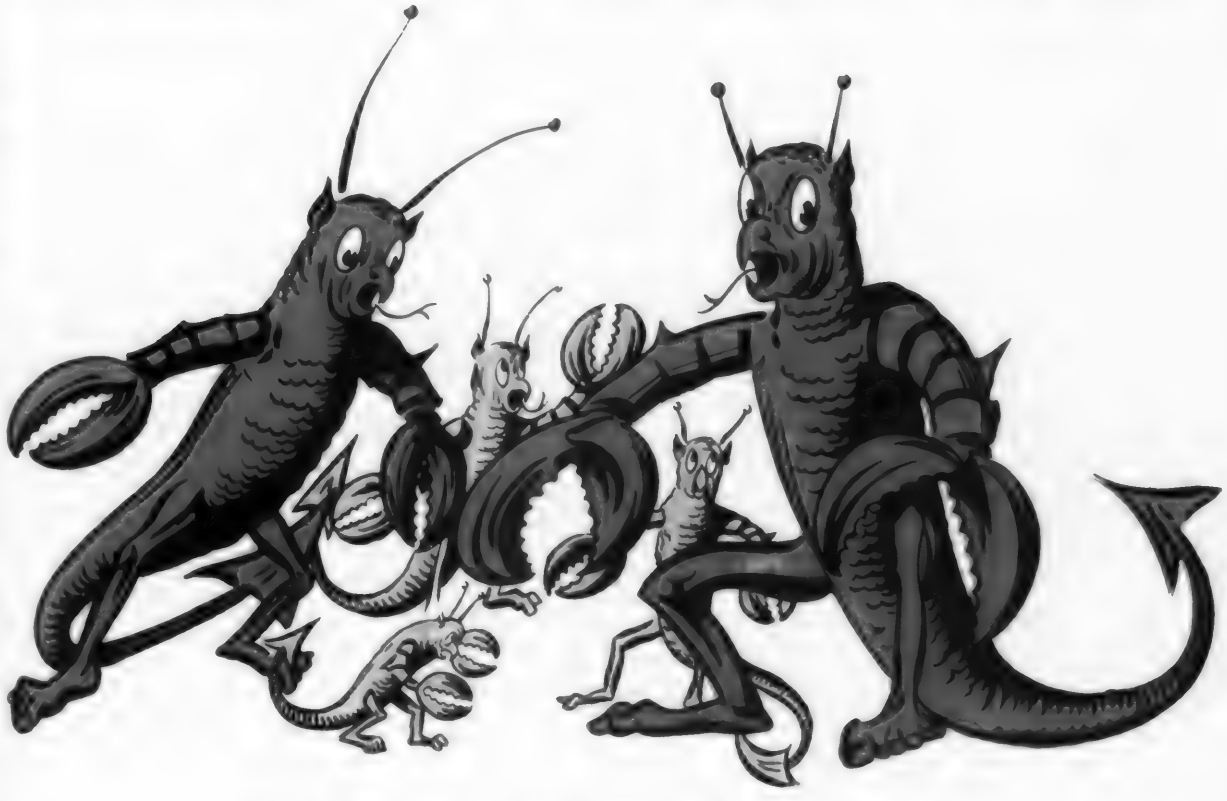
BACTERIOLOGY, DAIRY. The advances in this subject are described in the following reviews:

Mattick, Hiscox and Christian (1933), *JDR*, **4**, 285. Mattick, Hiscox and Davis (1935), *JDR*, **6**, 422; (1937), *JDR*, **8**, 369; (1939), *JDR*, **10**, 515; (1941), *JDR*, **12**, 350. Hiscox and Rowlands (1947), *JDR*, **15**, 170.

Text-books. Chalmers; Hammer; Orla Jensen; Rogers; Dorner, Demont and Chavannes (1945), *Microbiologie laitière*, Lausanne; Knudsen (1944), *Lectures on Dairy Chemistry and Dairy Bacteriology* (in Danish), Copenhagen; Tanner (1944), *The Microbiology of Foods*, Champaign, Ill.; Prescott and Dunn (1940), *Industrial Microbiology*, New York; Koroleff (1932), *Principles of Microbiology in the Dairy Industry* (in Russian), Moscow.

BACTERIOPHAGE. *See* Starters.

TROUBLE FOR THE GERM FAMILY



The use of vessels lined with "Lithcote" obviates metallic and bacteriological contamination of products such as foodstuffs and edible oils, whilst perfect sterilization and hygienic conditions are also assured. Lithcote linings resist abrasion extremely well and unlike vitreous linings do not "star" or craze. They can be applied either to new plant or for the reconditioning of old vessels either in situ or in our own works.

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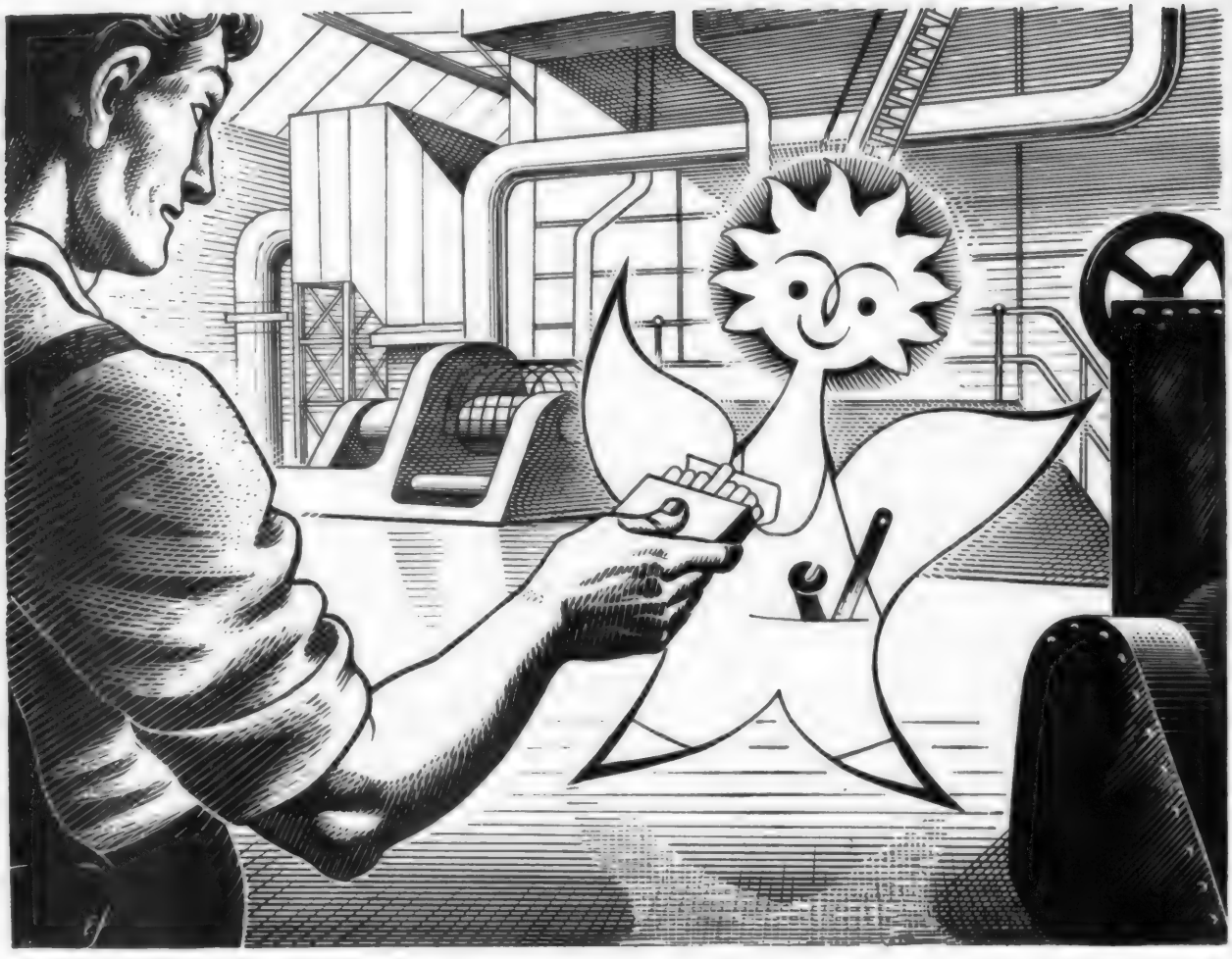

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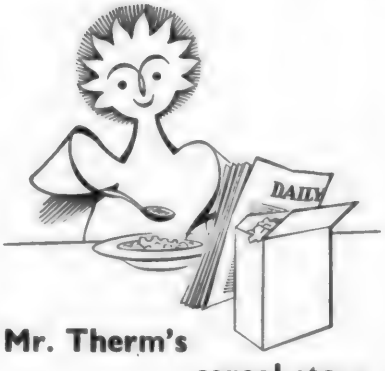

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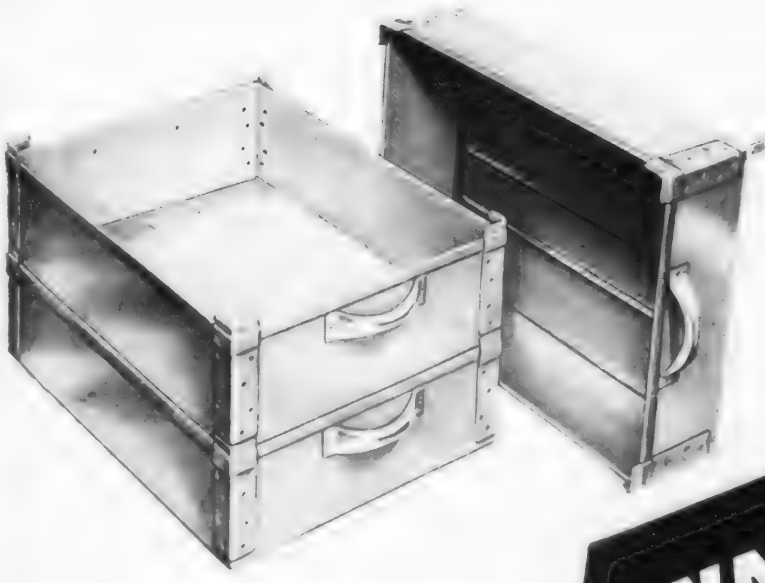

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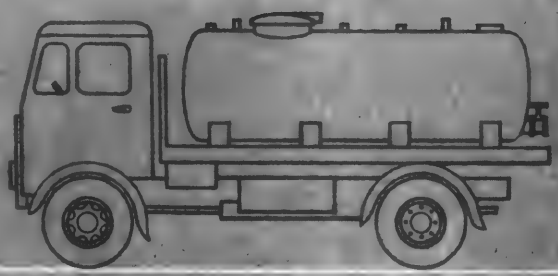

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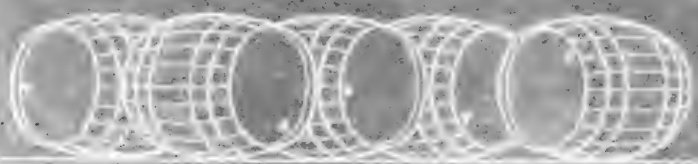

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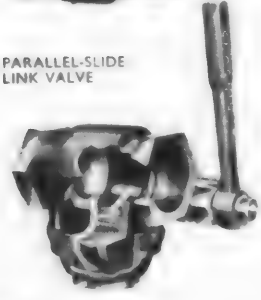

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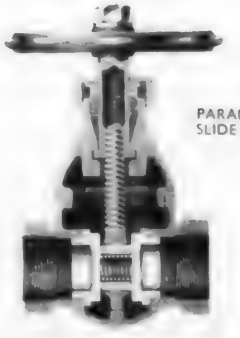

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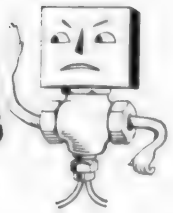
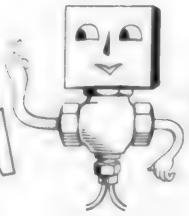


it's an OPEN  and SHUT case

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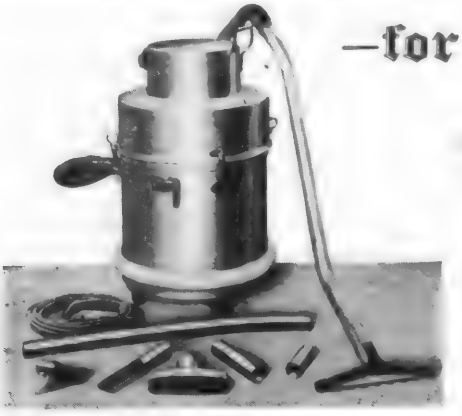
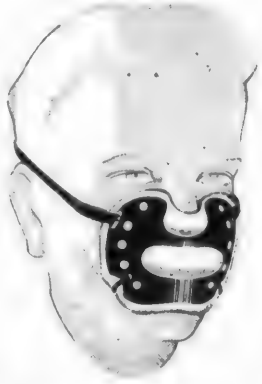
The MARTINDALE Trio!

INDUSTRIAL CLEANER · SUPER BLOWER · PROTECTIVE MASK

—for Factory Hygiene





The Martindale Industrial Cleaner is a sturdy, low-priced, large capacity machine for general dusting, cleaning sacks, powder collection, etc., with ease of handling and speed and efficiency of operation.

The Martindale Super Blower will blow the dust from electric motors, delicate scales and other apparatus. Fitted with Martindale suction cleaning attachments it becomes a high efficiency vacuum cleaner.

Martindale Protective Masks protect your workers from dust inhalation and your products from infection. Used by the million all over the world.

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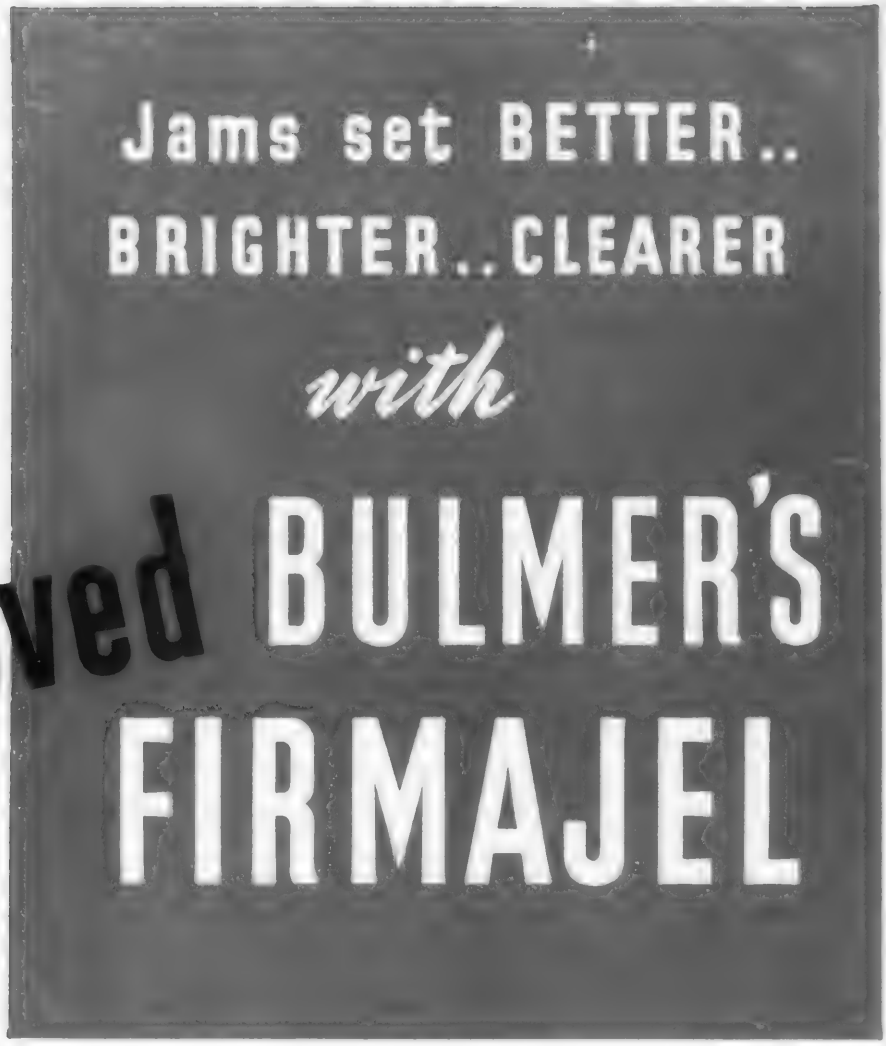
Write for descriptive leaflets to 11 WESTMORLAND ROAD · QUEENSBURY · LONDON · N.W.9



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Now Firmajel is Paler than ever in Colour and Free from Starch (no blue reaction to iodine test). This new standard Firmajel costs no more and is already used by most leading jam makers.

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The conveyor unit illustrated is designed for feeding potato crisps in bulk to automatic weighing and packaging machines. The design can also be adapted to handle sweets, wrapped or unwrapped, nuts and similar commodities.

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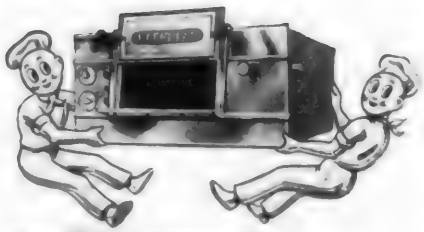
One Sir? or Two!



An important feature of the design of the Peerless oven is its adaptability. It can be supplied either as a single or double decker. Furthermore, the one or two units can be mounted either on a pedestal or on a proving cabinet as required.

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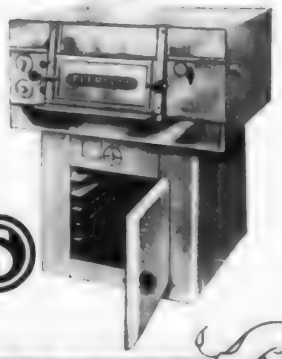

See our Stand numbers 67 and 68, Tonman Hall, City Hall, Manchester. January 31st - February 10th, 1951

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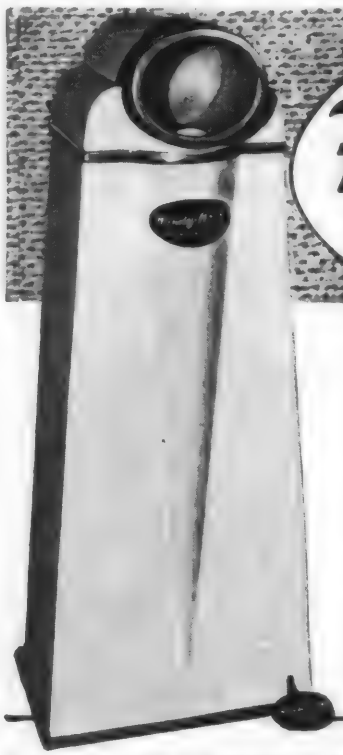

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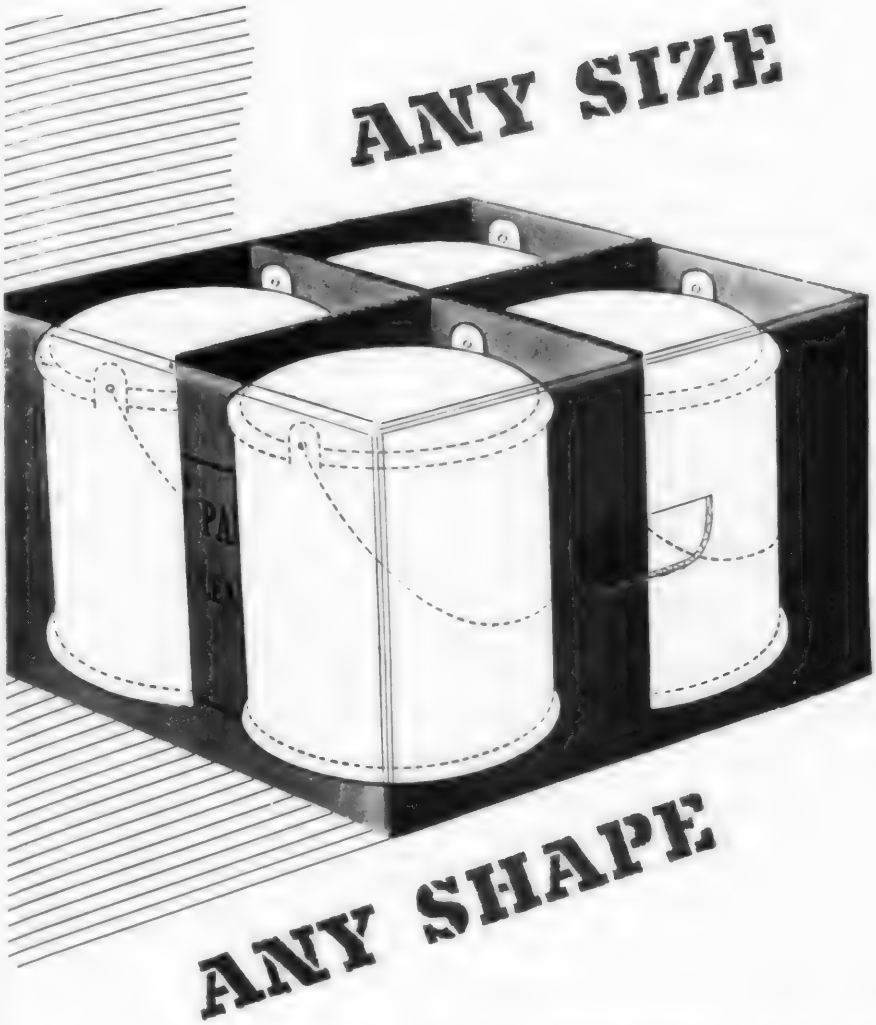

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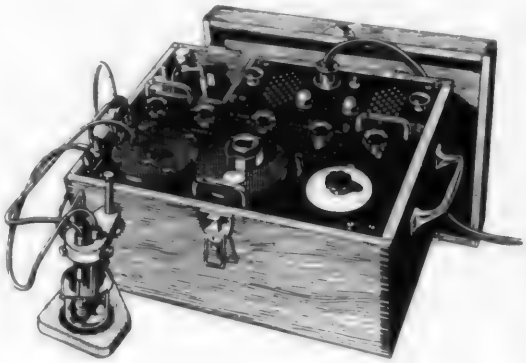

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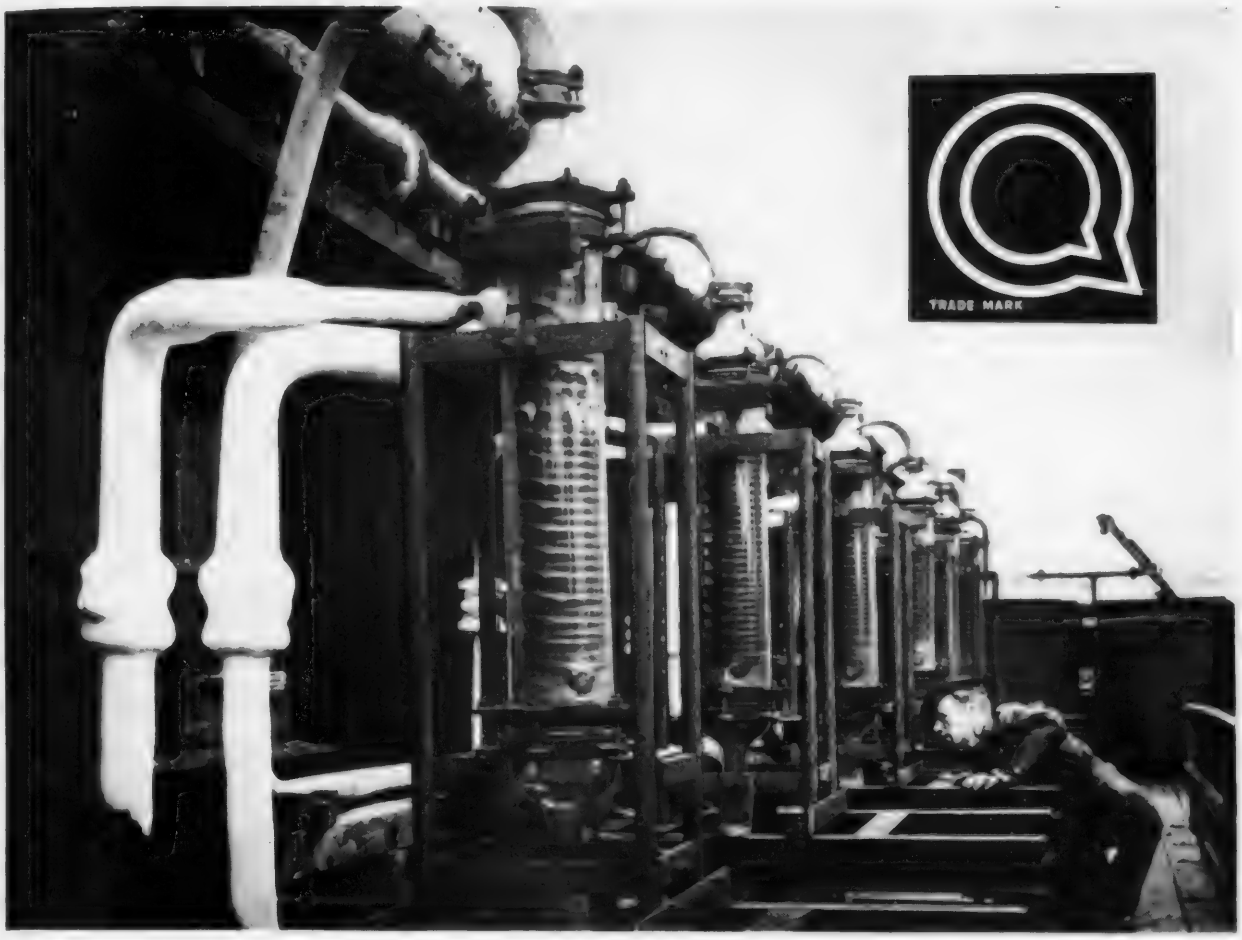

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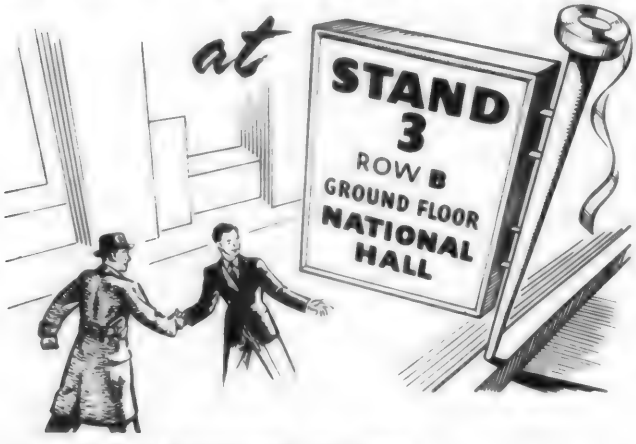
Let's shake hands at



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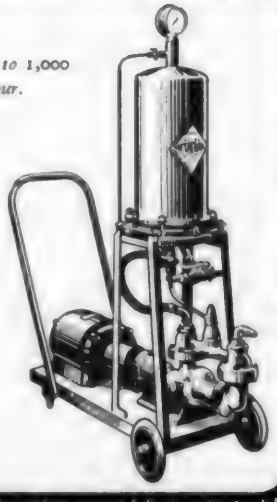

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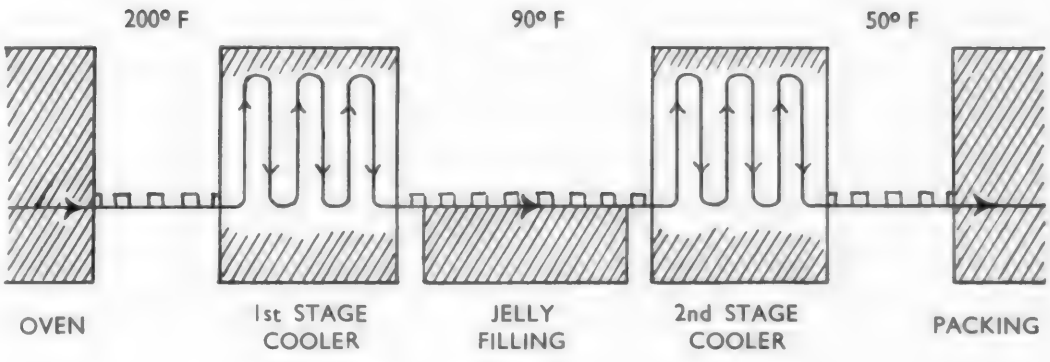

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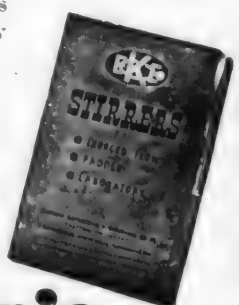

** A special Booklet No. 274 has been prepared, giving full details with diagrams, etc., and will be gladly sent on application.*

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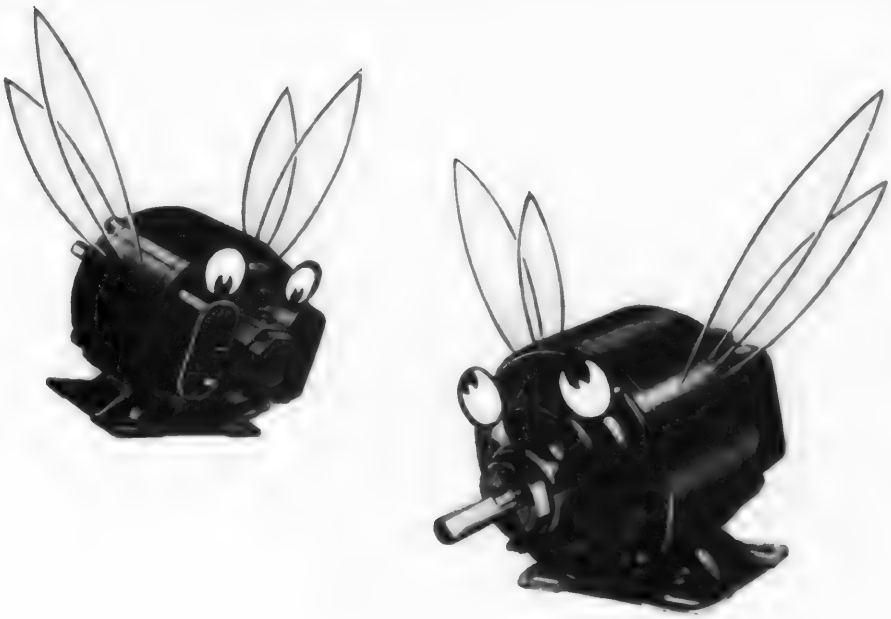

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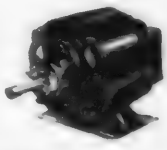

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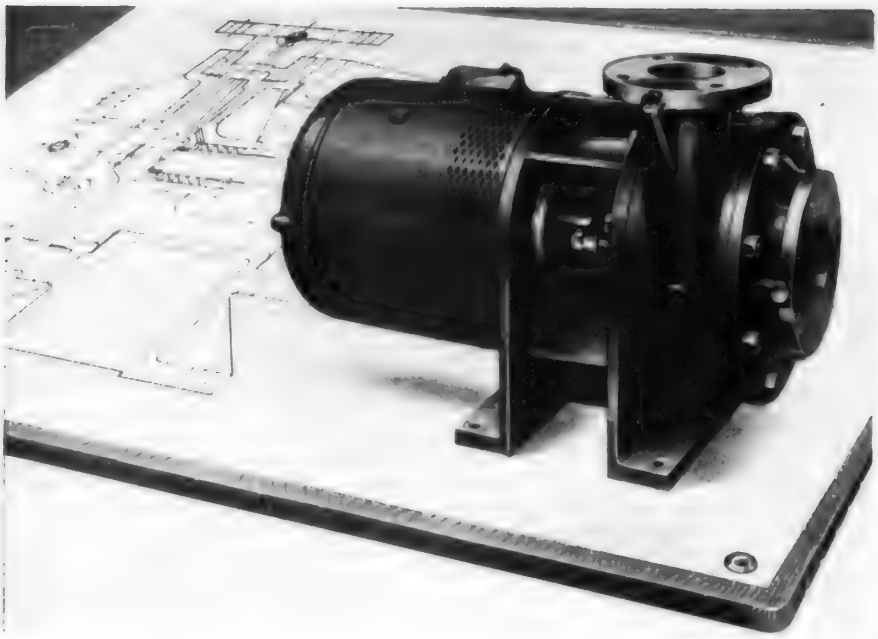

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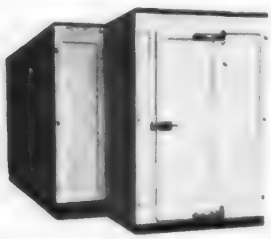

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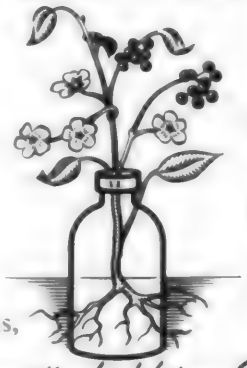

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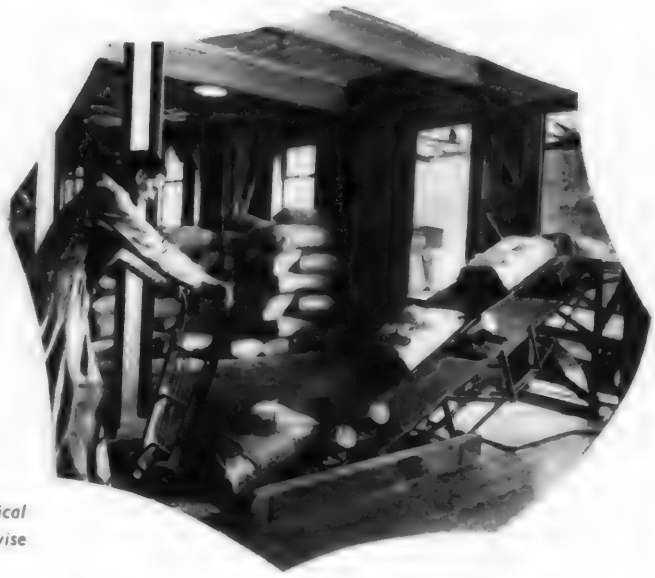

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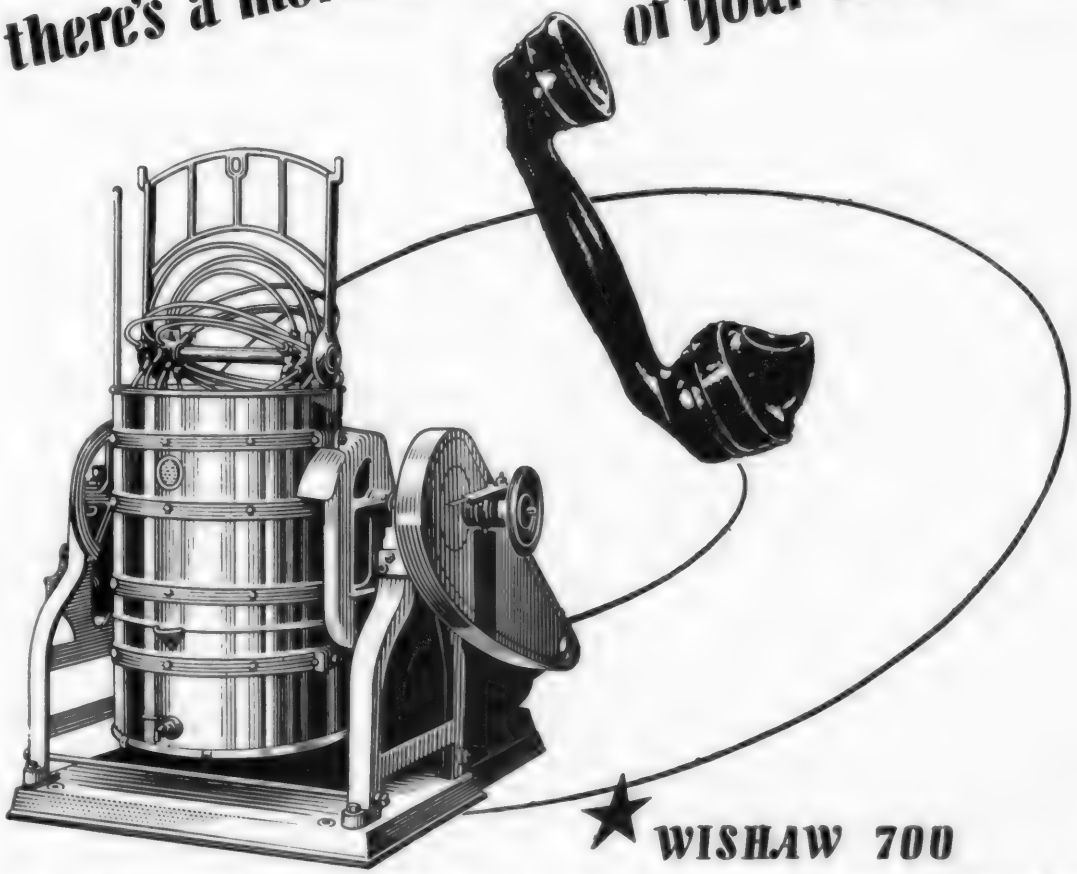

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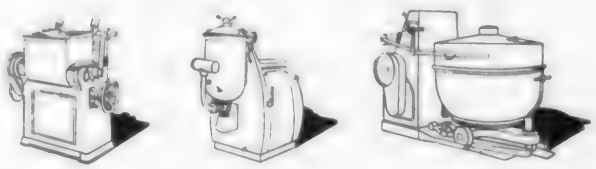

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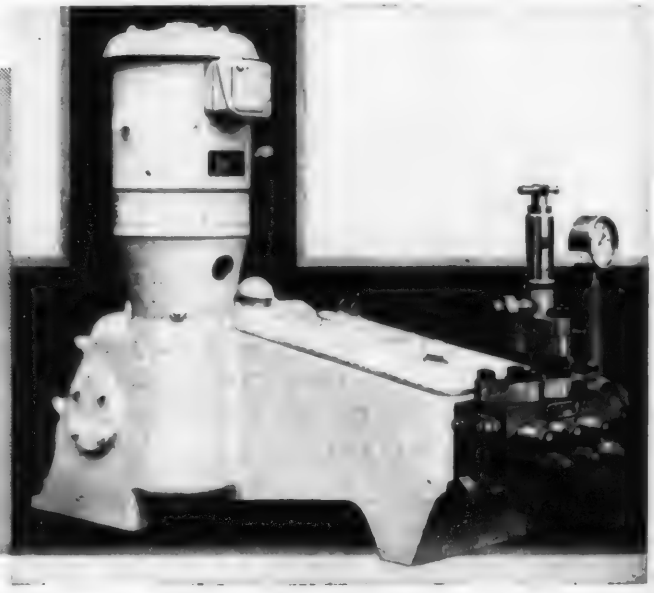

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FOOD MANUFACTURE

Vol. XXVI. No. 1 · Published Monthly · January 1, 1951

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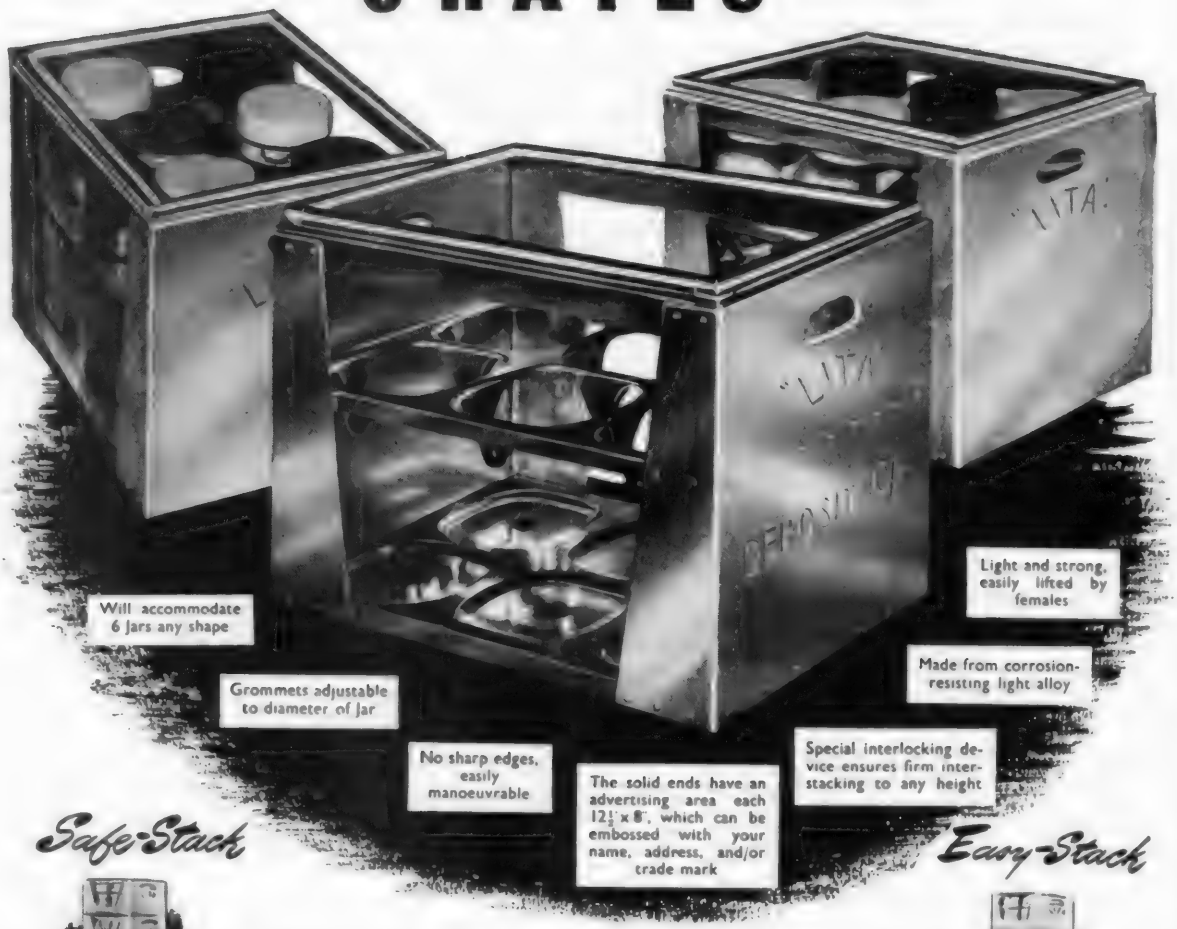
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FOOD MANUFACTURE

Vol. XXVI, No. 1 January 1, 1951

Hygiene in Meat Manufacture

THOSE who visit the cleanly, well-lighted, modern meat factories, glittering with stainless steel, go home with a comfortable sense of security. In those "halls of shining light" could not lurk salmonellae or staphylococci!

Unfortunately, that is not the whole story. Out of the 66,830 traders in Great Britain who make meat products for sale, there are only 830 large manufacturers, about 18,000 (including pie makers and bakers) who operate on a smaller scale, and 48,000 butchers.

A Working Party was appointed on May 31, 1949, "to review present trade practice and legal requirements for securing that conditions in the meat manufacturing trades are clean and sanitary, and that the products, and the materials from which they are prepared, are wholesome in all respects; to draw up, if considered desirable, agreed codes of practice for voluntary adoption by the trades concerned; to consider whether new or amended requirements by way of statute or regulation are desirable; and to make recommendations. . . ." The Working Party's report (which now requires the consideration of Ministers) has recently been issued, one useful section of which contains a summary of the law concerning the hygienic manufacture and wholesomeness of meat products, both in England and Wales and in Scotland, which differ in detail.

That there is room for codes of practice for voluntary adoption by the trades concerned, but that certain matters should be made statutory by Act of Parliament or by regulations, was the conclusion arrived at.

In 1949, a step was taken by the Ministry of Food by the issue of some model by-laws for the use of local authorities. The matter of hygiene in the manufacture of foods in general was thoroughly thrashed out at Eastbourne last June at the food and nutrition section of the Congress of the Royal Sanitary Institute, during which the extreme complexity of problems such as the training of personnel was evident from the discussion.

Covering the entire subject in an objective and fairly complete manner, the report contains a reservation, signed by six members, which asks that the recommendation for the registration under Section 14 of the Food and Drugs Act should extend to the occupier or manufacturers as well as to the premises. It acknowledges that food contamination may result from faulty premises and equipment, but feels there is the need for more inspection or supervision than is called for by the requirement for the registration of premises, and that the inspector should look at the particular business with an eye which would discern whether meat products are in fact being manufactured hygienically from the personal as well as from the environmental angle. It is claimed in this minority report that registration of the manufacturer would not be likely to add materially to the work of local authorities and that the present inspection would cover this point. We are inclined to agree with this view.

Aseptic Can Filling and Sealing

Modifications of the traditional methods used in the canned food industry are receiving the attention of technologists. One of the latest of them is an improved process for filling and sealing cans under aseptic conditions, developed and patented by the Continental Can Company of America.

The process consists of sterilising liquid or semi-liquid products in high-temperature, short-time tubular sterilisers, cooling the products to room temperature while still in a sterile state, and piping them into a sterile chamber in which there is a filler and sealing machine. Cans, sterilised beforehand, are transferred to this chamber by suitable valves, and are filled and sealed before coming into contact with the outside air.

Incorporating a direct method of injecting steam into empty cans by means of a rotary valve as they are sent to the sterilising chamber, the method purges cans of air content, and increases the rate of bacteria destruction in the cans, eliminating the

THE EDITOR SENDS SEASONAL GREETINGS TO ALL READERS

entrance of germ-bearing air into the closed sterile system.

Can covers are brought into the chamber with each can, and are also sterilised by the steam process. The technique includes a method for clinching sterile covers to sterile cans inside the filling chamber. After covers have been clinched into place, cans may be removed from the chamber and the sealing operation completed without danger in the open atmosphere.

The clinching method leads to greater canning efficiency, inasmuch as it obviates the necessity for complicated closing equipment inside the sterile chamber. In the past, when closing machinery adjustments have been required, complete re-sterilisation of the filling and closing room was necessary after these adjustments.

Meat Wastage must be Checked

Ninety per cent. of all cattle slaughtered during 1949 in one area of N.W. England was found to be affected by liver fluke in varying degrees. It is no small wonder that offal has become an under-the-counter delicacy for the favoured few.

This alarming state of affairs has been brought to light by the Association of Municipal Corporations, who rightly call for closer co-operation between health department meat inspectors, Ministry of Agriculture and Fisheries veterinary officers, and officials of the Ministries of Health and Food.

While it is agreed that this parasitic infestation is not communicable to man, it often renders the liver totally unfit for human consumption. That steps must be taken to eradicate the cause of this excessive wastage is evident, and the Ministry of Agriculture and Fisheries are already making efforts to see what can be done.

To date their endeavours in this direction have included research on the liver fluke itself, the efficacy of the various remedial treatments, and, most important, advice to farmers not only on the treatment of affected animals, but on preventive measures which could be adopted.

Attention has also been drawn by the Association to an even greater scourge—that of losses caused by tuberculosis in cattle which resulted in wastage not only of the offal but of the whole carcass.

It has been suggested (*The Municipal Journal*, **58**, 3005) that the best way of dealing with the problem is for more attention to be paid to the facts indicated by meat inspection returns. Before this can be done, it is essential to overhaul the system of recording the findings of meat inspectors to enable easy analysis. This involves the setting up of national machinery for making the fullest use of information gleaned in the abattoirs.

Government Control of Industry

The Supplies and Services Act 1945 (amended by the 1947 Act) was to have expired on December 10, 1950, but power was given by the Act for the granting of yearly extensions by the issue of Orders in Council. Such an Order has just been made by which the Act will remain in operation until December 10, 1951.

This Act gives wide powers of control over industry and private persons in that the Government may regulate or prohibit the production, treatment, keeping, storage, movement, transport, distribution, disposal, acquisition, use, or consumption of articles of any description. These matters arise from Parts III and IV of the Defence Regulations, from which Orders in Council (there are still over a hundred) were originally made. The foregoing and road and rail matters, agricultural affairs, requisitioning, etc., come under Part IV. Such things as limitation of supplies, the rationing of food, food control generally, and the direction of labour are covered by this Order, which also enables the taking over of shares of individual companies, although this power does not extend to nationalising whole industries.

Electronic Sterilisation

In December, 1948, FOOD MANUFACTURE reported the work of Brasch and Huber on the operation of the capacitron; since that time further developments have been announced in connexion with experiments which have for their object the sterilisation of foods by different types of radiation.

A recent release from General Electric of New York describes experiments in the bombardment of food with 800,000 volt electrons, or cathode rays, carried out by Mr. Elliott J. Lawton at their research laboratory. To produce the cathode rays, a million volt X-ray unit was used. In the X-ray outfit, a stream of electrons is speeded to a total energy of a million volts in a three-foot accelerating tube. At the end, they hit a tungsten target and X-rays are produced. For cathode-ray production a stainless steel "window" is substituted for the target, and the electrons themselves emerge into open air.

In common with other workers in this field, Mr. Lawton stressed that his findings resulted from experimental work and that it was too early to predict possible commercial applications, but that sterilisation by cathode rays should be particularly attractive for materials that would be damaged or destroyed by the heat required to sterilise them by the usual methods.

The general findings up to date are that cathode-ray sterilisation has considerable limitations. In some cases it causes changes in colour, taste, and odour of the material; it also produces chemical changes in many materials and deactivates enzymes.

In view of the scale of the investigations being conducted, and the large capital invested, it is evident that its backers are convinced that the method promises applicability on a commercial scale, without prejudice to the refrigeration, quick freezing, and canning industries.

Proposals for a New Science Centre

The recent announcement in the House of Commons that it has been possible to overcome the remaining obstacles to the adoption of the long-term proposals originated by the Royal Society for a British science centre in London will be welcomed by the leading scientific societies, whose lack of suitable accommodation has imposed handicaps on the advancement of British science. It will be some years yet before the Minister of Works can build such a centre, but a start is to be made as soon as resources can be found, having regard to other urgent claims.

Within the science centre new accommodation will be built for the Royal Society and for a number of other leading scientific societies with their important special libraries, most of which are now severely cramped in the rooms provided for them by the Government about 100 years ago in Burlington House or in other inadequate accommodation. Designed to improve facilities, and contacts between scientists and those applying scientific operations, both nationally and internationally, the centre will also include the Patent Office and its library, which will be modernised and extended as a first-rate reference library of science and technology, and new offices for the Department of Scientific and Industrial Research and other Government scientific organisations.

After-dinner Arsenic

Chicory roots, like hops and malt, are customarily dried in coke-fired kilns by direct exposure to the flue gases. As all cokes, whether from gas works or coke ovens, contain arsenic in both volatile and non-volatile forms, some transfer of arsenic to substances dried in coke fire gases is inevitable. A paper dealing with the arsenical contamination of chicory during drying (*Journal of the Science of Food and Agriculture*, **1**, 9) shows that much of the arsenical contamination was found to be due to dust settlement upon the roots; but as there is considerable turning of the roots during the drying operations (a three-stage procedure lasting some 36 hours), additional dust contamination by dislodgment from the kiln surfaces is possible. Some of the dusts that collect in the kilns were found to contain 100-200 p.p.m. of arsenic.

Fortunately the kiln dried roots are never used for food before a further roasting and grinding treatment which, under present methods of roasting, results in a considerable removal of the arsenical contamination. As the authors point out, however, the development of enclosed roasting appliances from which fumes and dust are not exhausted or removed would conserve the arsenic.

Nevertheless, the conclusion of the paper provides some reassurance. Unless chicory roots in their kiln-dried form are contaminated to the extent of 5 p.p.m., a beverage prepared from pure roasted and ground chicory and without loss of arsenic during roasting will keep below the recommended limit of 0·1 p.p.m. for liquid foods. The highest arsenic content of dried chicory measured in these experiments was 1·4 p.p.m.

Rice in Europe

It is usually supposed that rice is an exclusively Eastern crop, but a recent article on agricultural developments in France reveals that growing this cereal is not a monopoly of Asiatic farmers or of Asiatic soils (*Agriculture*, **57**, 8). Rice was regularly grown in southern France until the depressed 'thirties, when its cultivation became uneconomic. During the war, however, rice cultivation was revived, and the steady expansion that has occurred since is a remarkable tribute to the flexibility of French farming.

Between 1942 and 1946 rice acreages in the Rhone delta region increased from 1,200 to 2,500, and by 1949 the figure jumped to 300,000 acres. This huge expansion has been encouraged by the maintenance of a most favourable price, three-and-a-half times that of wheat.

The revival of this crop has been far from easy. Extensive irrigation of the land has been essential and the rice fields must remain flooded until the harvest, which coincides with the major harvest of France, the grape vines. Normal mechanical methods of cereal harvesting cannot be used in flooded fields, yet the rice must be gathered when labour is scarcest. To overcome this problem, the rice growers of France have developed a slow pre-harvest draining of the fields that enables mechanical harvesters mounted on tank or caterpillar tracks to be used.

The French revival of rice growing would seem to offer agricultural scientists two opportunities. Firstly, the production of an early ripening rice variety would be particularly welcomed by the French farmers; and secondly, the discovery of a selective weedkiller that deals with rice field weeds. The hormone weedkillers that are so effective in wheat fields and pasture have so far proved ineffective with the major weeds that accompany rice.

Opening the Can

We are wondering whether the writer of a recent leader in an evening paper had been trying to open a tin and had a sore hand. He was certainly very sore about food containers in general and eloquent on the subject of the ineptitude of the canning industry. The cranky outpourings about canned foods themselves and the jeremiads on the modern can-opening housewife are always with us, but here we have a lament about the difficulty of getting the food out of the can.

"Why cannot preserve manufacturers fit screw tops to their jars?" the writer asks, but immediately proceeds to complain about the difficulty of getting them off the jar. We pass that one on to the preservers.

The writer takes exception to the lids with the device "Pierce here." "A man," he says, "will first jab with a fork that bends double in his hand. He then aims a more determined blow with a can opener, which slides off and transfixes his other hand to the table. Then, so far as his injuries permit, he goes to work with a hammer and chisel and, in the moment of victory, oxtail soup erupts with explosive violence, and makes a rich brown dapple on his new blue serge."

Evidently a clumsy and impatient fellow, who doesn't keep a cheap gimlet in the drawer with one or two other little gadgets. In any case, oxtail soup tins do not have the legend "Pierce here" on their lids.

Fork-breaking, fumbling, nervous, querimonious fellows, incapable of driving a nail in the wall without hitting their fingers, should call in their wives in these emergencies. Owing to some compensating dispensation of Providence they usually marry practical women, who deftly wield the tools of the trade and know where the tincture of iodine is kept.

Cave Canem

In 1725 there was one John Rudge who bequeathed to the parish of Trysull in Staffordshire "twenty shillings a year that a poor man might be employed to go about the church during the sermon and keep the people awake; also to keep dogs out of church." This came to mind when we heard that from Manchester, the Tyneside, and Skipton in Yorkshire has come the demand that dogs should be banned from food shops. Most vociferous are 2,000 Manchester grocers, who claim that pets sniffing round while their owners are in the shop constitute a major threat to hygiene.

The crescendo of these complaints has made itself heard in the House of Commons. Mr. Webb, in response to a question by Sir Waldron Smithers, agreed that dogs were out of place in shops, but sadly doubted if he could keep them out by regulation.

Voluntary action by the public and the food trade is advocated, and already some food shops display notices prohibiting customers from taking in their animals. "Unfortunately," says Mr. Alban Curtis, secretary of the Northern Council of Grocers, "the dogs cannot read, nor apparently can their owners. Some grocers are using aniseed trails, the most successful of which in Manchester is one leading to the street gutter."

We wonder whether the ingenious grocers have realised that the trail may be a two-way one, as successful in bringing dogs in as in keeping them out of the shop. The idea of two processions of dogs across the pavement is intriguing.

Catering in 1851

Preparations for the Festival of Britain, with plans for housing and feeding large numbers, bring to mind some interesting details relating to the 1851 Great Exhibition.

Early in that year it was found necessary to find accommodation and make feeding arrangements for the multitude of workmen engaged in constructing and installing the exhibits in the monster "greenhouse" of Paxton. In view of the lack of specialised knowledge of industrial catering as it is understood today, it is astounding to learn that at one establishment known as the "Mechanics' Home," for example, 1,000 persons could be accommodated for the night at a cost of 1s. 3d. a head, each man having "a good wool mattress, sheets, a blanket and coverlid, with soap, towels, and every convenience for ablution." Boots could even be cleaned at 1d. a pair! As to food, here were "soups, cold meats, pork sausages and bacon, potatoes, salads, fruit pies, cheese, eggs; also a band of music to entertain the men over ale and porter between 8 and 9 p.m.—and a complaint book in the hall."

Visitors too were looked after, lest they should be led "into hundreds of amusements tempting the stranger to London, calculated to excite rather than to improve, to debase instead of elevate." Among exhibits classified as "Substances Used as Food" were "non-perishable" products like honey, chocolate, Fortnum and Mason's preserved fruits, Gunter's cakes, and Colman's mustard, to say nothing of a huge canister of boiled mutton which had been dumped on one Arctic expedition and rescued in perfect condition in 1849.

As alcoholic drinks derived from normal sources were banned, visitors had to be content with looking at "champagne" from rhubarb, sparkling hock from raisins, honey and sugar, Madeira wine from malt and syrup, and Frontignac flavoured with elder flowers.

Potatoes in Packets

To the layman, a potato crisp is simply a thin slice of potato, fried to a state of crispness—apparently a straightforward manufacturing process with no special problems, whereas the operations which are necessary to get those ounces of fried potato into the packets which have been so popular for the last thirty years offer an interesting study in modern hygienic food manufacture.

AMONG the three dozen or so British firms which are engaged principally in the production of potato crisps is the young and enterprising company Berkley Hygienic Food Products, Ltd., of Grimsby. This company was formed as recently as March, 1949, since when its two directors, Mr. R. Willey and Mr. W. Mumby-Croft, have pursued a progressive policy which bears out the name of the firm.

Fully Automatic Operations

It is claimed that the Berkley potato crisp plant is the only fully automatic manufacturing unit in Great Britain, and the product remains untouched by hand from the moment the potatoes arrive in the factory to the moment when the packet of crisps is opened by the consumer.

The factory covers some 25,000 sq. ft., and, by virtue of the automatic equipment installed, has a pay-roll of less than fifty.

At the time the firm commenced operations it was difficult to obtain equipment for the works, as food machinery manufacturers were not then producing a great deal of equipment designed specially for potato crisp production. The company experimented with various types of machine, but found their immediate answer to the problem by organising their own engineering department for the design and production of their equipment. Shortly afterwards, manufacturers began to produce specialised equipment, and the Berkley directors were able to order what they needed.

Meanwhile, their plant consisted of eight open-type frying pans and a number of slicing machines, all these items being of their own design and make. Packets were filled and sealed by hand; the pay roll numbered twenty. The crisps, which were being marketed under the name Humpty Dumpty, were distributed in Lincolnshire, Nottinghamshire, and Leicestershire. Sales increased rapidly, and the number of employees rose to one hundred and twenty.

Humpty Dumpty crisps are now marketed in all parts of Great Britain, and delivery is made entirely by the company's own transport. About 50 tons of Lincolnshire-grown potatoes are used each week. These are of one special variety, so as to ensure even texture and colour in the finished crisps.

The hopper feed over the vibratory conveyor on to the slatted elevator.

Cleaning and Slicing

The initial stage of manufacture is in the "rumbling machine," which removes all skin and dirt. This consists of a revolving drum, lined with carborundum and subjected to high-pressure water jets, and has a capacity of 1 cwt. per minute.

The clean potatoes are fed by hopper to the slicers, which operate with a knife setting of $\frac{1}{32}$ in., their accuracy ensuring the uniform quality of the crisps.

If placed in heated oil with the full starch content, the slices

The crisps are carried along one of the vibratory conveyors. *Photo Grimsby Evening Telegraph.*

would tend to stick together. In order to remove surplus starch, more washing with high-pressure jets follows the slicing. De-starching is followed by partial dehydration. Revolving drums, known as "hydros," remove 75 per cent. of the water content, leaving the slices dry and ready for frying.

Frying the Crisps

From the hydros, the slices are conveyed to the frying department in special containers where they are loaded into open-type cooking pans, ranged in batteries of eight, in which teaseed oil is heated by gas burners to a temperature of 300° F. Because of the high rate of absorption, which necessitates the hourly addition of fresh oil to the pans, the oil never becomes discoloured or stale while in use.

A fixed quantity of potato slices is used for each "fry," which is completed in 3½ minutes. In order to obtain even colour and perfect crispness, the contents of the pan are agitated throughout the whole of the frying period, and the operation is kept under continual supervision. Speed is of the utmost importance when removing the fried crisps from the pan; a matter of only a few seconds extra in the oil can com-

The layout of the overhead vibratory conveyor, showing the six automatic filling and weighing machines.

pletely ruin a batch. The crisps are then placed on stainless steel trays, ready for packing.

Oil extractors account for surplus oil which has emerged with the crisps. The revolving drum used in this process is perforated, and turns at high speed in a container fitted with heating elements to keep the oil free-running. Surplus oil drains through the perforations into a container at the bottom of the machine, and is then ready for use again.

The Packing Department

In the packing department the crisps are fed through a hopper on to a vibratory horizontal conveyor, whence they are fed to an inclined slatted conveyor, and then to a further horizontal conveyor running for a length of about 20 ft. Sited on either side of this conveyor are automatic weighing and filling machines, two important features of which are a hydraulically controlled vibratory feeding mechanism, providing smooth, uniform flow, and the employment of both coarse and fine feeds, ensuring high accuracy of weighing. Driven by a small hydraulic pump, the feeds are controlled by solenoid-operated valves in the hydraulic system, thereby dispensing with clutches, shafts, bearings, and exposed drives. The crisps are weighed into heat-sealable bags, ready for the automatic sealing machine, which comprises a conveyor, bag stretcher, heat-sealing unit, and bag elevator. The whole operation is a continuous one. The pocket-type conveyor collects 100 packets a minute direct from the weighing machines, and moves them, in an upright position, to the bag stretcher. In this part of the operation, wire fingers are inserted into the open top of the bag, and then opened out to the full width of the bag, making the top straight and flat. At the same time, the bags are aligned for the sealing machine.

The salt twists, obtained from a bulk supplier, are introduced into the packets just before they reach the thermostatically controlled heat-sealing unit. The tops of the bags enter the unit between two metal bands on moving rollers, and as the bands come into contact with the heating elements, the sealing process begins. It is completed when the bags pass between the heating elements. As the bags leave the sealer, they are taken by a series of rubber grippers, timed to open and close on each bag, and placed on a conveyor belt for transit to the packer.

One of the fluid flow automatic weighing and filling machines in operation.
Photo Grimsby Evening Telegraph.

Tins, containing 24 packets, are cellulosed green as a precaution against damp and rust, and are sealed with paper strip. An electric glueing machine completes this operation.

The installation of automatic equipment has raised production by over 300 per cent. Last year, when hand filling was employed, the daily output was 24,000 packets (1,000 tins) a day. This output has now risen to 66,000 packets a day, and further increases are anticipated. Another result of the automatic installation is that the company has been able to enter into a scheme whereby the employees will include a high percentage of limbless ex-servicemen, and this scheme is now being implemented.

SUPPLIERS OF EQUIPMENT

Frying ranges: *J. E. Dale.*
Rumbling machines: *Peerless and Ericsson.*
Oil extractors: *Crypto.*
Vibratory conveyors, and automatic weighing and filling machines: *Geo. Driver and Son.*
Slatted conveyor: *A. L. Marshall (Carlton).*
Pocket conveyor and bag stretcher: *Strachan and Henshaw.*
Slicing machines, electric lifts, elevators, and electrical contracting: *Manufactured and carried out by the company.*

Fruit and Vegetable Research

IN ORDER to enable the staff to publish papers in the appropriate scientific journals and to allow them more time for the preparation of bulletins on subjects of interest to technical men in the canning industry, the 1949 annual report of the Fruit and Vegetable Preservation Research Station, Campden, omits the publication of scientific articles and is confined to a general summary of the Station's activities during the year.

During the period under review canners' problems and technical enquiries were dealt with, and the Station has continued to act for the Ministry of Food in supervising the work of the Ministry's Inspectors and in examining canned beans in tomato sauce for quality and composition.

Variations in Processing

The most comprehensive investigation undertaken during the year was a study of the effect of time and temperature of processing on the quality and nutritive value of canned vegetables. The indications are that variations in the time and temperature of processing result in detectable changes in composition of certain of the constituents of the vegetables tested (fresh peas, stringless beans, carrots, beetroot, potatoes, and processed peas) and also in the colour, flavour, and texture of the canned vegetables.

Ascorbic Acid in Canned Foods

Experiments in the estimation of ascorbic acid in canned foods have shown that interference due to ferrous salts can be overcome by the use of media other than metaphosphoric or oxalic acid. A sodium acetate-hydrochloric acid buffer of *p*H 0·65 both inhibits the oxidation of ascorbic acid by copper or enzymes, and also permits titration to be carried out without interference from ferrous salts.

Bacteriological studies were concerned with an outbreak of flat sour spoilage in canned peas, traced to infection after sterilisation. Three types of bacteria were visible in the smears from the sour cans:

1. A very small coccus. All attempts to grow this organism failed.
2. A larger coccus. This organism was isolated and was found, very probably, to be a species of Leuconostoc.
3. A short rod. This organism was isolated and was found to be a species of Lactobacillus, producing lactic and acetic acids, but no gas, from dextrose.

Cooking water from the factory, examined some months after these cans were packed, contained about 700 bacteria per ml. in which gas-producing short rods predominated. The type 2 coccus was, however, isolated from the water.

It was concluded that, at the time of the outbreak, the gas-producing types were less abundant in the water than the types which produce no gas. Fortunately the former usually predominate in unchlorinated cooling waters, and the chance of the latter alone entering through a leak is consequently slight.

Work on the heat resistance of the spores of thermophilic bacteria has been continued.

High Vacua in Cans

A method of obtaining high vacua in cans, which may be used either to supplement or to replace the normal heat exhaust, is described in the report. This consists of passing the cans through a steam tunnel about two feet long which leads directly into the seaming head of the closing machine where a jet of steam plays across the surface of the contents as the cans are being closed.

In the first year's trials, cans of rhubarb, loganberries, damsons, and plums closed after steam injection showed up to three inches greater initial vacuum than similar cans closed normally after a heat exhaust of six minutes at 190° F. and had 6 to 30 per cent. longer shelf life before they became hydrogen swells.

A number of experiments were made during the course of the year on artificial sweetening agents. It was found that dulcin could not be used to replace sugar in the syrups for dessert canned fruits, but might be added in certain circumstances to increase the sweetness of fruits canned in AIO cans, or of bottled fruits. Other experiments were also made with grape syrup, glucose, maltose, honey, and fondant cream.

Correspondence

To the Editor of
FOOD MANUFACTURE

The Cider Crisis, 1950

DEAR SIR,—I have read with interest the editorial in the November issue of FOOD MANUFACTURE, and I am glad to be able to reassure you that some efforts are being made by the cider trade to absorb as many cider apples as possible this autumn.

In Herefordshire, for instance, my firm is taking a record quantity of apples by concentrating the juice of cider apples surplus to our requirements next season. We have been dealing with about 500 tons of cider apples a week by concentrating the juice since the beginning of the apple season, and the concentrators are still in action.

This is in addition to apples for our usual cider requirements and, although it is too soon to say for certain, it is probable that in Herefordshire and district the percentage of cider fruit which cannot find a market will be a very small one.

Finally, as the largest growers and suppliers of young cider apple trees in the country, we are finding no lack of demand from growers for young trees this season. In fact, we are unable to supply all that are required.

Yours faithfully,
H. H. BULMER.

Hereford.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Progress in Vitamin A Research

Research on the importance of vitamin A as an ingredient of the diets of man and animals has now been in progress for nearly forty years. Diets deficient in this factor lead to injuries to the mucous membranes, eyes, bones, and nerves, though in acute deficiency death may prevent the full development of all the characteristic lesions. Much is now known of the chemistry and distribution of this once mysterious compound, although our understanding of its mode of action is still fragmentary. At a recent meeting of the Nutrition Society, held in Liverpool, the present position of our knowledge of vitamin A, as approached from various angles, was reviewed by investigators having expert knowledge in their own particular fields.

VITAMIN A, unlike many more recently discovered dietary factors, was known in the distant past by its action, if not by name. Thus the ancient Egyptians, and later the Greeks, recorded in their writings that liver, now known to be a rich source of vitamin A, was effective in curing defective vision in dim light. The yellow colour of carotene, from which the vitamin itself is formed in the animal body, has moreover been familiar to human eyes for as long as carrots have been cultivated in their present form. The vitamin was also made visible, although at first with no clue to its significance, when cod liver oil was found to give an intense purple coloration on treatment with concentrated sulphuric acid. This reaction was at first regarded by manufacturers as a sign of inferior quality, and the production of oils giving low colour reactions was recommended.

Research from many Angles

The convergence of these three separate avenues of approach has made vitamin A an unusually fascinating subject for research, in which workers in many branches of science have been concerned. Thus physiologists and biochemists have defined the role of vitamin A in the visual processes, and have shown how it is related to the pigment "visual purple," which is formed by the retina in the dark. Botanists have been interested in the distribution of carotene, and similar yellow pigments, in green and yellow plant tissues. They have no doubt asked themselves why the root of the common carrot should be so rich in carotene while that of the parsnip, and even of some varieties of carrot, should contain only traces.

Organic chemists, in years of systematic toil, have elucidated the structural formula of carotene, and other carotenoids, and have succeeded in synthesising vitamin A itself. The blue colour formed by the vitamin on treatment with antimony trichloride, a great improvement on the original sulphuric acid, has engaged the attention of spectroscopists, who have also studied the characteristic absorption band of vitamin A in the ultra-violet region.

Early Investigations

Soon after the American workers McCollum and Davies had differentiated the dietary factor "fat-soluble A" of butter from the "water-soluble B" of yeast it became obvious that cod liver oil was a particularly rich source of the A factor, as measured both by its ability to promote growth in rats receiving a deficient diet and by its colour reactions. Laborious attempts at its isolation were undertaken by a group of Japanese workers and by Sir Jack Drummond and his colleagues in England. Although Drummond completely refuted the claim of the Japanese to have isolated the vitamin in its pure form, they must at least have credit for noticing its absorption band and characteristic fluorescence for the first time, and for discovering the toxic effects of large overdoses.

While the frontal attack on the problem had temporarily failed, however, useful progress was being made on the flank. In America, Steenbock was impressed by the consistency with which vitamin A activity was associated with yellow pigmentation. Thus butter, the original experimental source of vitamin A, was yellow, as also were many vegetables and fruits having similar activity. The same conclusion was reached by Drummond and Miss Coward in Great Britain. Tests on isolated carotenoid pigments, however, were unsuccessful until in 1928 von Euler, in Sweden, found that the pure hydrocarbon carotene, $C_{40}H_{56}$, which had long been known to give colour reactions similar to those of vitamin A, was also capable of exerting its physiological activity.

The Conversion of Carotene

It was recognised that the substance which Drummond and others had been attempting to isolate from cod liver oil could not possibly be carotene, since active concentrates had very little colour, and at first there was a tendency to ascribe von Euler's observation to the contamination of his carotene with vitamin A as an impurity. Moore, however, showed that this theory was untenable, and demonstrated that if carotene made from carrots was given to rats the colourless vitamin A characteristic of cod liver oil appeared in their livers. This conversion of carotene to vitamin A in the animal body was fully confirmed in chemical work by the Swiss organic chemist Karrer, who had been interested in the carotenoid pigments long before their relation to vitamin A was appreciated. Vitamin A was found to be an alcohol, $C_{20}H_{30}O$, half the size of the carotene molecule.

With the discovery that the liver oils of the halibut, and of many other fish, were much richer

in vitamin A than that of the cod, progress towards the isolation of the vitamin in pure form was greatly accelerated. In 1935 Hamano made another contribution from Japan in preparing certain esters of vitamin A in crystalline form, while in the same year the Americans Holmes and Corbet at last succeeded in crystallising the vitamin itself. In spite of important advances by Sir Ian Heilbron, however, the artificial synthesis of vitamin A was not satisfactorily achieved during the next decade, being finally accomplished independently by several teams of workers, headed by Milas, Isler, Shantz, Van Dorp, and others.

Vitamin A in Practical Nutrition

Although vitamin A has lost all mystery as a chemical substance, and has become a commonplace product of the manufacturing chemist, our knowledge of its value as a supplement to the British ordinary diet remains vague. It is clear that in India, and other tropical countries, subsistence on diets low in carotene not infrequently leads to a disease of the eye known as xerophthalmia, which is often followed by permanent blindness in young children. During the first world war the same disease afflicted Danish children when their share of the country's butter supply was exported abroad and was replaced by unvitaminised margarine. It is much less clear, however, whether the addition of vitamin A, mainly derived from whales' livers, to Britain's margarine supply should be regarded as an indispensable step in maintaining our health, or merely as an insurance that even members of our population who consume abnormally small amounts of milk and vegetables should run no risk of even a partial deficiency of vitamin A.

Before the second world war Moore examined the reserves of vitamin A in the liver in cases of accidental death in Great Britain. It was concluded that most healthy subjects, if they had been restricted to a diet deficient in the vitamin, would have had reserves sufficient to last them at least several months. The spread between high and low reserves, however, was very wide, and the risk of deficiency appeared to vary considerably between individuals. During the war the liver reserves were certainly not reduced, and in children they appeared to be increased. The maintenance of good vitamin A reserves in spite of the austerities of our war-time diet is readily understandable in view of the compulsory vitaminisation of margarine and the publicity campaigns to encourage the consumption of green vegetables, carrots, milk, and cod liver oil.

While it is certain that severe deficiency of vitamin A is injurious to health, it is much more questionable how far an increase in consumption above the body's minimum requirements confers any benefit. An answer to this problem will emerge only from further research on the biochemistry and mode of action of vitamin A. The recent meeting of the Nutrition Society, therefore, served a valuable purpose in facilitating the interchange of information between workers studying vitamin A from different angles, and in suggesting directions for possible advances.

Provitamins A

When carotene was found to act as a precursor of vitamin A, tests were also made with other carotenoids. Xanthophyll, a hydroxylated pigment which accompanies carotene in all green plant tissues, and which gives egg yolk its characteristic yellow colour, was found to be quite ineffective. The pigment lycopene, which gives tomatoes their red colour although it is itself yellow in dilute solution, was also incapable of conversion into the vitamin. On the other hand, it was soon found that carotene exists in more than one form, and that its different isomers, α, β, γ, etc., possess different degrees of biological activity. Not all carotenoids other than the carotenes, moreover, resemble xanthophyll and lycopene in being inactive. Thus cryptoxanthin, present in maize, and echinenone, isolated from sea urchins, were found, together with several other pigments from somewhat uncommon sources, to be capable of acting as provitamins.

Chemical Requirements

The chemical requirements necessary for biological activity were reviewed by Mr. T. W. Goodwin. The main requirement is an intact β-ionine ring, at least at one end of the molecule. Since β-carotene has this structure at both ends of its molecule, while α-carotene and other biologically active carotenoids have it at only one end, it perhaps seems unnecessary to look further for an explanation of β-carotene being at least twice as effective as other provitamins. It is still not quite clear, however, whether the β-carotene molecule splits neatly down the midde to form two molecules of vitamin A, or is split at some other point in the central chain, with part of the molecule being wasted as a source of vitamin A. Mr. Goodwin also referred to the various derivatives of vitamin A which have biological activity. Among these vitamin A acid is particularly interesting, since there is no evidence that it is either converted to vitamin A in the body or stored in the body in unchanged form.

The Standardisation of Vitamin A

Carotene, which is very readily crystallised, was available in relatively pure form long before vitamin A was isolated. A specimen of carotene made by mixing samples contributed by several laboratories was therefore taken as the first International Standard, with 1 microgram as the unit. Miss E. M. Hume, who has taken a leading part in the standardisation of vitamin A through all the intricate phases which followed this simple starting point, described them faithfully and lucidly at the conference.

The first complication was the discovery that the original specimen of carotene was only 60 per cent. pure, which necessitated the reduction of the unit to 0·6 microgram of the next supply of really pure material in order to preserve continuity. It was subsequently necessary to find a factor which

would relate the extinction coefficients, found in the estimation of the vitamin by the ultra-violet spectrophotometry, with the international units which would presumably have been found in biological tests. A factor of 1,600 was proposed as the result of extensive co-operative tests in which vitamin A concentrates were compared with the standard carotene in regard to their abilities to promote growth in rats.

In America, however, where an unstable cod liver oil was set up as a subsidiary standard, a figure of 2,000 seemed more appropriate. Miss Hume mentioned the difficulties which arose when vitamin A concentrates sent to Britain during the war from the U.S.A. had to lose 25 per cent. of their nominal activity merely through crossing the Atlantic. Agreement has now been reached, however, by taking pure vitamin A acetate as a new standard, with 0·3 microgram of the vitamin itself as the unit. The new unit is almost identical in biological activity with the old carotene unit, which is retained for estimation of provitamins.

Human Volunteers

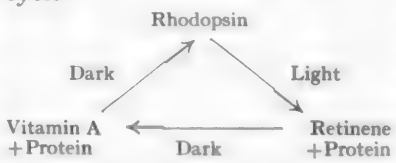
Miss Hume also referred to the important investigation carried out in Sheffield during the war, in which a group of about twenty conscientious objectors volunteered to subsist on a diet from which as far as possible all sources of vitamin A and carotene were excluded. The progress of depletion was followed mainly by periodical examinations of dark adaptation, and by estimations of carotene and vitamin A in the blood plasma.

In agreement with Moore's examination of the liver reserves normally possessed by healthy adults in Great Britain, it was found that the volunteers did not readily become deficient. Although the carotene level of the blood declined rapidly during the first few weeks of the experiment the vitamin A level showed little change, and dark adaptation was for a long time unaffected. Eventually clear evidence of deficiency was found in three volunteers, who were cured by dosing with vitamin A or carotene. The other volunteers failed to become depleted, although some received the diet for nearly two years.

One of the volunteers who became deficient was cured by daily doses of 1,300 i.u. of vitamin A, and another by 2,500 i.u. of carotene in oily solution. Allowing a safety margin of about 100 per cent. the appropriate daily requirement of preformed vitamin was assessed as 2,500 i.u. In estimating the requirement of carotene, however, allowances had to be made for its inefficient absorption, since examinations of the faeces indicated that it was excreted in proportions which varied according to the form in which it was eaten. Thus the requirement for β-carotene given as an oily solution was assessed at 4,000 i.u., as cabbage or spinach 7,500 i.u., as homogenised carrots 5,500 i.u., and as boiled, sliced carrots 12,000 i.u.

Visual Purple

The clinical observation that deficiency of vitamin A caused serious impairment of the powers of vision at night raised the question of the role played by vitamin A in the visual processes. The first step in solving this problem was made in America by Yudkin, who found that the retinas of pigs contained substantial amounts of vitamin A. Wald later confirmed this claim in various animals. He noticed, however, that when retinas of dark adapted animals were removed and then bleached by exposure to light their visual purple, also called rhodopsin, was converted to a yellow pigment, which he named retinene. This eventually led to the discovery of the rhodopsin cycle



Professor R. A. Morton, who spoke to the conference on the role of vitamin A in vision, was himself responsible for the important discovery that retinene is the aldehyde of vitamin A, from which it can readily be formed by oxidation with manganese dioxide. Wald has recently given added significance to this finding by showing that retinal extracts contain an enzyme system capable of reducing retinene back to vitamin A.

The Site of Conversion of Carotene

In the early experiments of Moore the vitamin A which was formed when carotene was given to rats appeared mainly in the liver. It was suggested, therefore, that the conversion probably took place in this organ, although no claim was made that this point was finally proved. Attempts by Drummond and others to convert carotene to vitamin A by incubating it with liver tissues, or by perfusing the intact organ, gave no clear evidence of success.

More recent work by Deuel in America, and by Morton and Kon in Great Britain, has indicated clearly that in rats and pigs carotene is converted to vitamin A in the intestinal walls. Drs. S. K. Kon and S. Y. Thompson, who described their experiments on rats and pigs, demonstrated the conversion both by the antimony trichloride method and by the appearance of yellow fluorescence in the chyle after large doses of carotene had been given. While it is clear that the intestines are capable of converting carotene, it is possible, according to Kowalewski and Henrotin, that this ability may at least be shared in the liver.

Vitamin A in Arctic Animals

The liver of the whale, which is very rich in vitamin A, may conveniently be used to fortify the margarine which is made from the blubber of this animal. The source of this wealth of vitamin was long a matter of speculation, but about ten years ago Wagner claimed to have isolated large amounts of carotene from the krill, or shrimps, which form the main food of many species of whales. Kon has now questioned the validity of this claim as the only carotenoid which he could

detect in any quantity in shrimps was inactive astaxanthin. Many specimens of shrimp, however, contained considerable amounts of preformed vitamin A. This observation is perhaps surprising, since vitamin A was at one time thought to be produced only in vertebrate animals. Locusts, which might be taken as a land species approximately equal to shrimps in evolutionary development, have been found by Goodwin and Srisukh to contain both carotene and astaxanthin, but no preformed vitamin A.

Livers of Polar Bears

Dr. T. Moore alluded to his work with Rodahl in which the livers of polar bears were found to hold enormous quantities of vitamin A. As already mentioned, large excess of vitamin A is toxic, and its concentration in the bear's liver presumably explains the toxicity of this organ, which has caused poisoning in unwary explorers since Elizabethan times. It appears that the bear derives its vitamin A from the livers of seals, which have in turn accumulated large stores by preying on cod and other fish.

Sex and Vitamin A

Dr. Moore, in a joint paper with Dr. I. M. Sharman, also discussed the interesting effects of sex on the storage and distribution of vitamin A. Booth and others have shown that under the same dietary conditions the livers of female rats usually contain much more vitamin A than those of males. Data on human livers have been inadequate to show whether a similar difference exists between men and women. It is clear, however, that the reverse situation is found in human blood, with the average for men being slightly in excess of that for women.

Experiments have now indicated that in the rat the storage of vitamin A in the kidney is considerably greater in males than in females, while in the blood the same relationship is found as in humans. It would appear, therefore, that in the female sex the ability of the liver to retain vitamin A is greater than in the male. From another point of view, however, it may be argued that the rapidly growing male is more efficient than the female in mobilising vitamin A from the liver into its blood and tissues.

Vitamin A in Disease

Data presented by Drs. Moore and Sharman indicated the effects of disease in lowering the levels of vitamin A in the blood and livers of human patients. Particularly low liver reserves have been found at autopsy in cases of chronic kidney diseases. The average for this group was only about one-tenth of that found in accidental death, and the vitamin was often completely absent. It is obvious, however, that before suspecting that vitamin A deficiency contributes to causing kidney diseases allowances must first be made for the effects of the disease on the absorption and storage of the vitamin.

Vitamin A Deficiency

The final contribution to the discussion was made from the point of view of a medical specialist by Dr. Z. A. Leitner. In reviewing the effects of vitamin A deficiency in animals, he referred to Sir Edward Mellanby's distinguished work on blindness caused in experimental and farm animals by constriction of the optic nerve. This has been shown to result from a disorganised overgrowth of bone, which causes a narrowing of the channel through which the nerve passes from the eye to the brain.

Skin Diseases

Warkany's important experiments on the effect of vitamin A deficiency during pregnancy in causing gross malformation in the young, leading to blindness or circulatory failure, were also described. Dr. Leitner also mentioned that in agreement with other workers he had often found low levels of vitamin A in the blood in certain rare skin diseases, including Darier's disease, pityriasis rubra pilaris, and ichthyosis. These diseases, moreover, were often improved by heavy doses of vitamin A. In work with Drs. Moore and Sharman he had followed up the finding that low levels of vitamin A in the blood commonly occur at high body temperatures and had made an extensive study of this abnormality in rheumatic fever.

Research in Agriculture

Work on the foraging behaviour of honey bees which shows that a bee leaving a hive without a preconceived idea will seek food in the crevices of any small coloured moving object, and that in subsequent foraging, the individual bee is continually exercising both choice and memory, formed part of the work of the Bee Department of the Rothamsted Experimental Station, whose report for 1949 was recently published.

Among other studies are those concerned with the mode of action of toxic substances and factors affecting the susceptibility of insects to toxic materials carried out by the Insecticides and Fungicides Department. In response to the Colonial Insecticides Committee's request, experiments have been undertaken on the persistence of DDT sprayed on foliage. Analysis showed no loss of DDT from films on cabbage leaves during the period of one month, unless exposed to rain or short wave ultra-violet light. The deposit might be attenuated, however, by expansion of the leaf.

Also included in this report are a soil survey of England and Wales and special reviews on nutritional problems in forest nurseries and on the relation between soil cultivation and crop yields.

The Measurement of Detergent Strength

J. G. DAVIS, D.Sc., Ph.D., F.R.I.C.

Part I

It is doubtful if there is one industry today which does not use at least one type of detergent[1-7] for one or more operations[8-12]. The recent drive for improved hygiene in the manufacture and handling of food has resulted in considerable interest in the methods for cleaning and sterilising food equipment. To the layman the word "hygiene" is usually more closely associated with sterilisation rather than cleaning, but it cannot be emphasised too strongly that of the two operations the efficient cleaning of equipment is far more important in industrial practice than sterilisation. The cleaning of equipment not only removes food residues, which by acting as a source of nutriment for bacteria could lead to heavy growth, but also mechanically removes the overwhelming proportion of bacteria remaining on the equipment. Sterilisation certainly kills the few bacteria remaining, including any that may be pathogenic, but it is safe to say that if all equipment associated with food were thoroughly cleaned and rinsed immediately after use, the number of cases of economic faults and food poisoning would be reduced to negligible proportions.

FOR the purpose of this article the term "detergent" is used only in respect of the alkaline salts such as sodium hydroxide, sodium carbonate, sodium silicate, and sodium phosphate.[7] Other types of detergent, such as the anionic and the cationic, are also of great importance today, but as they are chemically so different in properties they cannot be considered in the same way as the alkaline type of detergent.

Reasons for Measurement

There are two main reasons why in industry today the strength of detergent in any operation should be continually measured. The first is that cleaning can be efficient only if the concentration of detergent is maintained at the necessary level, which can be found by experiment if necessary, to give good results. Other conditions such as temperature, pressure, etc., must also be fulfilled.

The second reason is that the efficient industrialist will cost all aspects of his work. Money spent on detergents, especially in some industries, can be considerable, and it is obvious that if unnecessarily high concentrations are used the process is not being carried out as economically as possible. All those experienced in the use of detergents will agree that the strength of detergents for any operation should be maintained within reasonable limits, *e.g.* 0·75 and 1 per cent. A concentration below the experimentally determined minimum will give imperfectly cleansed equipment and high bacterial counts, while an unnecessarily high concentration leads to a wasteful use of detergent and may even lead to certain troubles under some conditions, *e.g.* foaming.

Haphazard Methods

It is still common to see detergents being used in the most haphazard way, especially where the operation is done by hand. Even where machine washing is practised, such as for the washing of bottles and cans, it is still fairly common for the operative to put in, say, one bucketful at the beginning of the working period, *e.g.* 8 a.m., and then to add nothing further until, say, 2 p.m., when a further half-bucket may be added. Naturally, the rate of loss varies enormously, according to the type of operation involved, but tests under such conditions have shown that the initial concentration may be, say, 1 per cent., falling to about 0·2 per cent. after 2 hours, and to a negligible strength after 4 hours. "Topping up" will return the solution to something approaching its original strength, but this rapidly falls thereafter.

Where equipment, utensils, or containers are cleaned by hand it is obviously not economic to have anything at all elaborate for measuring the strength of the detergent solution, but machine washing is becoming more and more common, and it is probably true to say that hand washing of bottles and other containers will virtually cease in a few years. All machines, whether of the spray or soaker type, incorporate a tank of detergent solution, the strength of which can always be measured by some suitable means.

Causes of Loss of Strength

There are three main causes of loss of strength of detergent solution: dilution, "carry-over," and neutralisation of the alkalinity by acidic substances and carbon dioxide.

Dilution of the detergent solution is brought about by the residues of water in and on the bottles, cans, etc., as they either pass into the detergent tank or as the spraying by the detergent solution begins. Since there is, or should be, a pre-rinse, there is always some dilution, and this naturally varies with the size, shape, and material of the utensils and the period of drainage between the pre-rinse and the detergent wash.

The "carry-over" is analogous to the dilution, except that it is now the remnants of the detergent solution which pass on to the next rinse tank. An adequate period of drainage is a most important factor in economy in detergent use.

The rate of neutralisation of an alkaline detergent solution depends upon the nature and quan-

tities of the acidic substances present. If pre-rinsing is efficient, no acidic substances should pass into the detergent tank, but inevitably a certain amount get in. For milk bottles, the relevant substances are the proteins, lactic acid, and fatty acids from the milk residues; for beer bottles acetic and other acids; for fruit drinks citric, malic, and other acids; and other food and drink containers have their well-known alkali-neutralising residues. In all cases carbon dioxide plays a role, and its concentration in the adjacent atmosphere and the type of machine, *e.g.* jetting or soaker, are important factors in this respect.

Minimising Losses

It is impossible to say what are the respective contributions of these three major factors in the loss of detergent strength, but the proportions can vary widely according to the type of operation. Thus in a well-designed bottle-washing machine the "carry-over" should be small, but with other containers, such as cans, the "carry-over" may be enormous. Many years ago the author observed that within an hour or two of the beginning of operations, the "hot rinse" of a rotary can-washing machine actually became a stronger detergent solution than the detergent solution proper, due to the excessive "carry-over" by cans.

Losses of this nature may be minimised not only by a proper design of washing machine but also by a proper design of container. Thus the ordinary milk can, which, when inverted, gives very poor drainage from the base, will retain considerable amounts of detergent solution on the inverted base, and so result not only in excessive loss due to "carry-over" but also in poor sterilising efficiency by steam jets on account of the cooling effect of the residual liquid on the inverted base of the can.

The neutralising effect of food and drink residues will depend on the efficiency of pre-rinsing and also on the period between use and washing, since liquids containing carbohydrates invariably go sour on ageing.

The various methods in which a detergent solution can lose strength are illustrated in Table 1. It will be seen that all these fall into two groups—either the detergent is diluted by addition of water, or it is chemically changed by addition of substances which neutralise alkalies.

TABLE 1

THE THREE MAIN MECHANISMS OF WEAKENING OF DETERGENTS

1. Dilution—entrance of water.
2. Loss—carry-over by containers.
3. Neutralisation:
   (*a*) $2NaOH+CO_2 \longrightarrow Na_2CO_3$ (carbonate)
   (*b*) $NaOH+CH_3.CHOH.COOH \longrightarrow CH_3.CHOH.COONa$ (lactate)
   (*c*) $NaOH+CH_3COOH \longrightarrow CH_3.COONa$ (acetate)
   (*d*) $NaOH+C_{15}H_{31}.COOH \longrightarrow C_{15}H_{31}.COONa$ (palmitate)
   (*e*) NaOH + protein $\longrightarrow$ Na proteinate

Different Methods—Different Results

Before discussing in detail the various known methods of measuring detergent strength, it may be emphasised at this point that different methods give different results in following through the deterioration of a detergent solution, because such a solution can lose strength through more than one mechanism. As this aspect is fundamental to the subject the point will be made clear by contrasting the two extremes. As a simple example there may be considered a 1 per cent. solution of caustic soda losing strength (*a*) by dilution down to 0·5 per cent., and (*b*) by neutralisation by carbon dioxide to such an extent that the sodium hydroxide is completely changed to sodium carbonate.

There are four principal methods of measuring detergent strength: specific gravity, *p*H, titration, and conductivity. The effect of these two deterioration mechanisms in relation to these four methods of measuring detergent strength is illustrated in Tables 2, 3, 4, and 5. The fall from 1 per cent. to 0·5 per cent. caustic soda by simple dilution is followed quite simply by the specific gravity and titration methods, because the relation between the strength of a caustic soda solution and both gravity and titration is for all practical purposes linear. Thus the values for 0·5 per cent. are exactly half those for 1 per cent. With *p*H measurements, however, the relationship between detergent strength and values given by this method is not a simple one. It will be seen from Table 3 that whereas the *p*H of a 1 per cent. solution of caustic soda is 13·1, the value for 0·5 per cent. is 13·0, a 100 per cent. dilution resulting in a fall of only 0·1 *p*H units.

When the weakening of a caustic soda solution by carbona-

TABLE 2

SPECIFIC GRAVITY OF DETERGENT SOLUTIONS AT $\frac{20^\circ}{4^\circ}$ C.

Concentration %.	*Sodium hydroxide.*	*Sodium carbonate.*	*Sodium silicate.**	*Sodium sulphite.*
1 ..	1·0095	1·0086	1·007	1·0078
2 ..	1·0207	1·0190	1·017	1·0172
3 ..	1·0318	1·0294	1·026	1·0267
4 ..	1·0428	1·0398	1·036	1·0363
5 ..	1·0538	1·0502	1·046	1·0459
6 ..	1·0648	1·0606	1·056	1·0556
Concentration changes % equivalent to difference of 0·001 in sp. gr.:	0·1	0·1	0·1	0·1

* Na_2O, 1·7 SiO_2.

TABLE 3

*p*H VALUES OF DETERGENT SOLUTIONS

	Concentration %					
	0·1	*0·2*	*0·5*	*1·0*	*1·5*	*2·0*
Sodium hydroxide	12·4	12·6	13·0	13·1	13·3	13·6
Sodium carbonate	10·9	11·1	11·3	11·4	11·5	11·8
Sodium metasilicate ($5H_2O$) ..	11·6	11·8	12·3	12·5	12·8	13·1
Trisodium phosphate ($12H_2O$) ..	11·3	11·5	11·8	12·0	12·2	12·4
Sodium pyrophosphate	9·8	9·9	10·0	10·1	10·2	10·3
Sodium tetraphosphate	8·6	8·6	8·5	8·4	8·2	—
Sodium hexametaphosphate	about 6·5					

TABLE 4

TITRATABLE VALUES OF DETERGENTS

	% Na_2O titrated to Phenol-phthalein.	Methyl Orange.
Sodium hydroxide ..	76·1	76·5
Sodium carbonate ..	28·7	57·3
Sodium metasilicate ($5H_2O$)	28·5	29·1
Trisodium phosphate ($12H_2O$)	13·0	24·3

tion is considered the picture becomes still more complicated. We begin with 1 per cent. caustic soda and end with 1·33 per cent. sodium carbonate. At intermediate stages both substances are present. From Table 2 it will be seen that the change in specific gravity is virtually negligible. The fall in *p*H value is considerable, the caustic soda value being 13·1 and the sodium carbonate value 11·4. The titration value varies enormously according to the indicator used. If phenolphthalein is used (according to common practice) the titration will indicate that the strength of a detergent solution has been reduced to half. If, however, methyl orange is used the detergent solution will be recorded as being of the same strength as it was originally. Conductivity measurements will indicate a marked falling in detergent strength to about one-third.

It is not always clearly understood why the different methods used to follow the fall in strength of a detergent solution give different results. This aspect will be clearer when the various methods are considered in detail, but it may be pointed out that this problem is analogous to many others in this respect, *e.g.* the bacteriological quality of milk may be returned in quite different grades depending on whether the bacteriological quality is measured by plate count, direct microscopic count, coli, methylene blue, or resazurin tests. Each of these tests measures a different property of the milk; sometimes they agree, sometimes they do not. The same applies to the various methods of measuring detergent strength.

Specific Gravity

The specific gravity of a solution at any given temperature is the ratio of the weight of a given volume at that temperature to the weight of the same volume of water at 4° C. As specific gravity is easily measured by a hydrometer, it is the method commonly used in industry for measuring the strength of solutions of salts and other substances, *e.g.* brine. The specific gravities of various alkaline salt solutions are given in Table 2, which shows quite clearly that the relation between strength and specific gravity is nearly linear and that for all the salts a change in specific gravity of 0·001 is equivalent to a concentration change of about 0·1 per cent.

Since it is usual to measure the strength of detergents at low concentrations, for example 1 per cent., it follows that specific gravity is not a very accurate way of measuring detergent strength. The error will be at least 0·1 per cent., and bearing in mind complications due to temperature and other factors, the error may easily amount to 0·2 per cent. Nevertheless the hydrometer method is very simple and cheap and can be used by anybody.

If, therefore, the problem is to measure the strength of a fair concentration, *e.g.* 5 per cent. of a detergent and an accuracy of only about 10 per cent. (of the 5 per cent.) is required, the hydrometer method is adequate for the purpose. If dilution is the only factor to play a part, the relationship will be linear. If carbonation or neutralisation by other weak acids is an appreciable factor, the hydrometer will not detect this type of weakening because the specific gravities of the carbonate, acetate, etc., solutions are slightly higher than those of the original caustic soda solution. Addition of other solutes will indicate a rise in detergent strength, which is not actually taking place.

pH Methods

The *p*H of a detergent solution can be measured by a simple colorimetric method or, more accurately (so it is generally assumed), by a *p*H meter. The first is simple, cheap, and can be used by anybody with normal colour vision, while the second requires an expensive *p*H meter and skilled knowledge. The *p*H values of common detergent solutions at different strengths are given in Table 3, from which it will be seen that although the different alkaline salts have fairly distinct ranges of *p*H values, for any one detergent the effect of change of concentration on *p*H is not great, in other words the *p*H method will be more sensitive to chemical deterioration than the dilution weakening, *e.g.* if a 1 per cent. solution of caustic soda becomes converted to a 1·33 per cent. solution of sodium carbonate, the *p*H value will fall from 13·1 to 11·4, but if a 1 per cent. solution of caustic soda is changed by dilution to 0·5 per cent. the *p*H value will fall only from 13·1 to 13·0.

As the indicator method is so different in technique from the meter method, these methods will be considered separately.

Indicators for *p*H determina-

TABLE 5

EFFECT OF DILUTION, CARBONATION, AND NEUTRALISATION ON 1 PER CENT. CAUSTIC SODA SOLUTION

Change.	Resulting solution (per cent.).	Titratable alkalinity.*	Effect on: *p*H.	Conductivity.	Sp. gravity.†
Dilution by addition of equal volume of water	0·50 NaOH	Halved	Negligible effect	Almost halved	Roughly halved
Carbonation (complete)	1·32 Na_2CO_3	Halved	Marked fall	Reduced to ½	Negligible effect
Neutralisation by acetic acid	2·05 sodium acetate	Reduced virtually to zero	Reduced almost to neutral point	Roughly halved	Slight effect

* To phenolphthalein.
† Difference from 1.

tions are chemical substances which change colour fairly sharply over a certain *p*H range. Many of them, such as the sulphonaphthaleins, change, for example, from a yellow colour to a very vivid colour such as blue or purple over a *p*H range of about 1·6 units. If great accuracy is not required it is unnecessary to add a known amount of indicator to a known volume of the solution, the colour giving sufficient information for the purpose. Indeed, it is quite feasible to add the indicator to the actual detergent solution so that a mere glance at the tank or jets is sufficient to indicate the approximate *p*H of the solution.

However, there are a number of objections to this rather primitive procedure. Some indicators are expensive, and many of those for use in the high alkaline ranges are unstable and decompose, losing their colour in so doing. A further difficulty is that the indicators are often easily adsorbed and so may be removed from solutions, sometimes staining the articles which are being washed. It is, therefore, much more satisfactory to add the required amount of indicator solution to 10 ml. of the detergent solution, matching the colour against a Tintometer disc in a comparator.

Indicators for Measuring Solutions

A list of indicators suitable for measuring detergent solutions is given in Table 6. It will be observed that these cover a range from about 10 up to about 13, which is the normal working range of detergent solutions. Some of these indicators are unstable and some are unduly expensive. Probably the most useful single indicator is thymol violet; the colour change for this and a few other of the most suitable indicators is given in Table 6.

There are very few industrial laboratories which do not have at least one *p*H meter. It is usually considered that this gives a more accurate measurement of *p*H than the comparator, but it must be borne in mind that the indicator method is more simple and foolproof than meter methods. The *p*H meter is eminently suitable for *p*H measurements when a series of tests have to be made, but it can readily be calculated that the cost of making a single measurement with a *p*H meter is very high. The instrument must be "warmed up," and when the glass electrode is used, as is now commonly the case, the electrode must be standardised in a buffer. Thereafter, it is a simple matter to make rapidly a large number of measurements.

Use of the *p*H Meter

The chief difficulty in using the *p*H meter for measuring detergent strength lies in the fact that high *p*H values, usually in the range 11 to 13, have to be dealt with. In such solutions the ordinary glass electrode does not give accurate values and soon deteriorates. It is necessary to use an electrode of a special kind of glass such as the *Alki* electrode, and even this will suffer damage if used repeatedly in strongly alkaline solutions.

The *p*H methods have the advantage that they are independent of conditions such as aeration, which may markedly affect specific gravity and conductivity, and when using the *p*H meter accurate volumetric measurement is unnecessary. All alkaline solutions absorb carbon dioxide from the air, and such absorption will affect *p*H to a greater extent than other properties such as specific gravity. It is essential, therefore, either to make the measurement immediately or to keep the sample in a well-stoppered bottle which is filled with the solution.

Instead of using the glass electrode, the antimony electrode may be used in alkaline solutions, and although not one of the most accurate electrodes, it is well worth consideration for industrial control methods. It is not necessary to add the oxide as a thin film is always present in practice. In time, antimony electrodes get coated with extraneous material, and it is advisable, therefore, to run at least two electrodes so that one can be in the course of being scraped and cleaned while the other is in use. Whatever electrode is used, it must be standardised in a buffer and, as the author has pointed out elsewhere,[13] it is always advisable to standardise in a buffer as near as possible to the *p*H value at which measurements are being made. This implies the use of a buffer in the region of *p*H 12, and although such buffers are known, special care is required in their preparation and storage.

Probably the most suitable buffer for this purpose is $\frac{M}{15}$ sodium borate, which has a *p*H value of 9·20 at 18° C. A buffer solution nearer the working range may be prepared by making a 1 per cent. solution of recently heated and cooled sodium carbonate in boiled distilled water. This solution has a *p*H value of 11·4 at 18° C. The borate and especially the carbonate solution will absorb carbon dioxide from the atmosphere, and the solutions must be kept in airtight bottles.

The quinhydrone electrode, although probably the most reliable electrode there is for solutions below *p*H 8 and devoid of reducing substances, is quite unsuitable for use in strongly alkaline solutions.

Titration Methods

Titration is the oldest and simplest way of measuring the strength of acid and alkaline solu-

TABLE 6

INDICATORS FOR *p*H IN THE HIGH ALKALINE RANGE

Indicator.	*Range.*
Thymol blue	8·0 (yellow) to 9·6 (blue)
Cresolphthalein	8·2 (colourless) ,, 9·8 (red)
Phenolphthalein	8·3 (colourless) ,, 10·0 (red)
Naphthol benzein	8·5 (yellow) ,, 9·8 (green)
Phenol violet	8·0 (yellow) ,, 10·0 (violet)
Phenol thymolphthalein	8·3 (colourless) ,, 11·0 (violet)
Thymolphthalein	9·3 (colourless) ,, 10·5 (blue)
Alizarin yellow GG	10·0 (colourless) ,, 12·0 (yellow)
Thymol violet	9·0 (yellow) ,, 13·0 (violet)
Quinizarin-sulphonic acid	10·5 (purple) ,, 13·0 (blue)

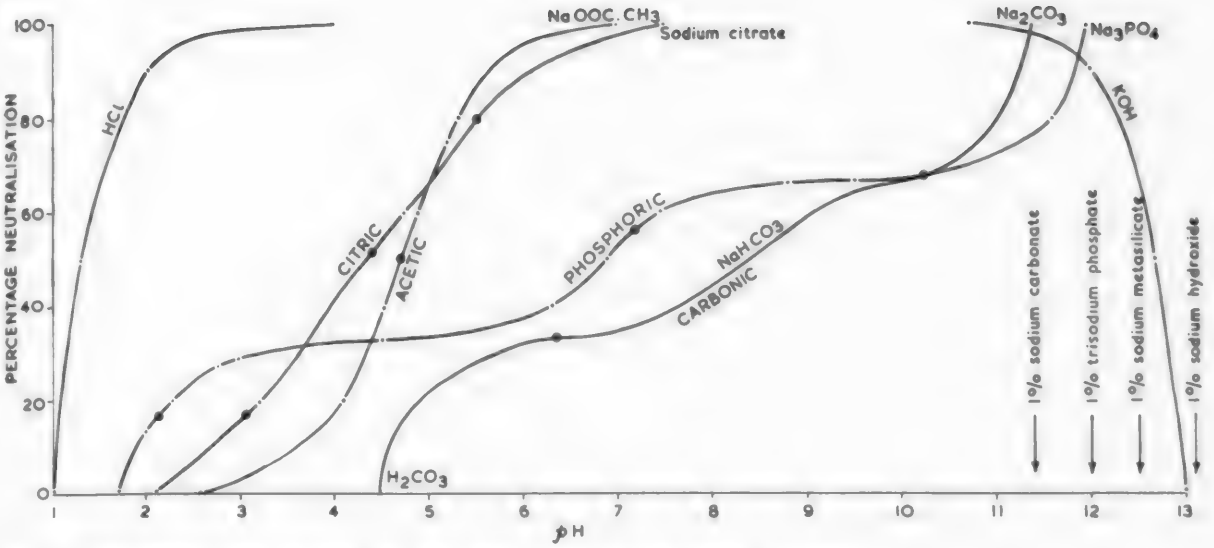


Fig. 1. Neutralisation curves of strong and weak acids. The large dots indicate pK values.

tions, and detergent solutions have for many years been tested by titration with $\frac{N}{10}$ hydrochloric acid, using phenolphthalein as an indicator.[14, 15, 16] This method will not give the same results as *p*H methods because a different aspect of alkalinity is being measured.

Buffering Values

Whereas the *p*H method measures the concentration of hydrogen ions in the solution indirectly through a potential measurement, the titration method really measures the buffering value of the detergent solution between its initial *p*H value and that at which the indicator changes colour, *e.g.* phenolphthalein changes from colourless to pink at about *p*H 8·3. When the alkalinity of a detergent solution is titrated, acid is added until the *p*H of the detergent solution is lowered to that point at which phenolphthalein ceases to be pink, *e.g.* at *p*H 8·2.

This aspect is illustrated in Fig. 1, which shows the neutralisation of different types of weak acid by hydrochloric acid. It will be observed that whereas sodium hydroxide maintains a high *p*H value until it is practically all neutralised, when the *p*H changes rapidly from about 13 to 1, sodium carbonate starts at a *p*H value of just over 11 and the neutralisation curve has two kinks which actually correspond to the *p*K values or negative logarithms of the dissociation constants of the acid concerned, which in this case is carbonic acid, H_2CO_3. Being a dibasic acid, it has two *p*K values and so two kinks in the curve which occur at *p*H values where its buffering power is the strongest.

It will be observed that between *p*H 8 and 9 the neutralisation curve is very flat and phenolphthalein will indicate a neutralisation up to this stage by its loss of colour when sufficient acid has been added to bring the *p*H down to 8·2. This is why it is commonly said that half the sodium carbonate is titrated when phenolphthalein is used as an indicator. If, instead of using phenolphthalein, an indicator such as methyl orange, which changes colour at about *p*H 3·5, is used, it will be found that twice the quantity of hydrochloric acid is now required. Thus, using methyl orange, the hydrochloric acid titrates the whole of the sodium carbonate, displacing all the carbon dioxide from the carbonate, whereas using phenolphthalein only half the carbonate is titrated, displacing half the carbon dioxide, and in effect changing the sodium carbonate Na_2CO_3 into sodium bicarbonate $NaHCO_3$. Phosphoric acid which, when fully neutralised with caustic soda, forms trisodium phosphate Na_3PO_4, has three hydrogen atoms in the molecule which can be replaced by sodium. It has, therefore, three dissociation constants, it behaves really as three quite different acids, and its neutralisation curve contains three kinks at *p*H values corresponding to the *p*K values of the acid.

Fig. 1 shows that since the *p*K values are 2·11, 7·16, and 12·66, neutralisation of sodium phosphate by hydrochloric acid to the phenolphthalein end-point will measure only one-third of the total salt present. If methyl orange is used two-thirds of the sodium phosphate will be titrated, and to titrate the whole of the salt it is necessary to use an indicator changing colour at a very low *p*H value.

In the light of these observations it will be clear that, although loss of detergent by dilution will be measured quite simply by the titration method, loss by chemical action, *e.g.* change of hydroxide to carbonate or acetate, cannot be readily distinguished by simple titration methods.

Elaborate Apparatus Unnecessary

Nevertheless, measurement of detergent strength by titration using phenolphthalein as an indicator is quite adequate for the purpose. No elaborate apparatus is required, as measurement is independent of temperature (for all practical purposes), but a portion of the solution must be drawn off and 10 ml. accurately measured.

If the laboratory is some distance from the washing machine this creates a further difficulty, but there is no reason why a burette, a bottle of $\frac{N}{-}$ hydrochloric acid, a 10 ml. pipette, and a dropping bottle with phenolphthalein indicator should not be kept in some convenient place close to the washing machine.

Conductivity of Solutions

Acids, alkalies, and salts when dissolved in water, possess the power to allow an electric current to flow through the solution. These substances vary considerably in the extent of this property and, at low concentrations, the amount of current passed varies regularly with the concentration. It also varies with the voltage or E.M.F. or, to quote Ohm's law, $C = \frac{E}{R}$ where C = current flowing in amperes, E = voltage applied in volts, and R = resistance in ohms.

Further we may say that $C = \frac{E}{R} = E.\ f(c)$ where f(c) is a function of the concentration of the dissolved acid, alkali, or salt. This last varies with individual solutes.

If a direct current is used, gas accumulates on the electrodes and not only increases the resistance, but can actually set up a counter E.M.F. so that the current falls markedly. This phenomenon, called *polarisation*, is not only one of the major sources of errors in conductivity measurements, but in the early investigations led observers to conclude that Ohm's law did not hold for solutions. It is now generally accepted that this law holds equally for solid conductors and solutions of electrolytes, except when very high E.M.F.'s or very high frequency alternating current is employed.

The conductance of an electrolyte like caustic soda can be considered by imagining 1 g. equivalent (40 g. in the case of caustic soda) dissolved in a very large volume of water held between two giant electrodes (or metal plates) 1 cm. apart. Under these

(*Continued at foot of next column*)

conditions virtually all the caustic soda is *ionised* or dissociated,

$$NaOH \rightarrow Na^+ + OH^-$$

into positively and negatively charged ions (cations and anions), which conduct the electric current, or deposit charges on the electrodes.

The conductance of the solution under the conditions described is called the *equivalent conductance* at the dilution given. The unit made by electrodes 1 sq. cm. in area and 1 cm. apart gives the specific conductance of the solution, so that if 1 g. equivalent is dissolved in V ml. of water equivalent conductance = (specific conductance) $\times V$.

(*To be continued*)

References will be included in the final part of this article.

Good Food Again

THE title of still another addition* to Mr. Ambrose Heath's already long list of recipes may appear to be over optimistic, especially when it is realised that the author wrote it in 1945. Perhaps it is just as well, as he says, that economic circumstances have denied its publication until now. The introduction to the original manuscript declares that it was written in the first anticipatory flush of victory, and in spite of subsequent disappointments in the nation's commissariat, the author did not feel, on re-reading it, that he wished to alter or delete anything. In his preface written in 1950, he reiterates his faith and says that what he optimistically expected in 1945 is now actually beginning to happen. There has been talk of cream, and eggs (or egg) and bacon are no longer a nostalgic dream. Mr. Heath apologises, however, for the presence, among so many utilitarian recipes, of "such highly creamy dishes as the beans *landaise* on p. 91, the cucumber (p. 94), the delicious trout *normande* (p. 44), and the truly exquisite smoked salmon tart."

Hope deferred maketh the heart sick, but at the same time, the large number of recipes may form an inspiration for those cooks whose souls rise above "plain boiled" and "roast." That Mr. Heath is an unconquerable optimist is evidenced by his suggestion: "Get the butcher to cut you up a pound of lean mutton into two-inch squares." It would be a temerarious housewife who would approach the 1951 butcher with such a request!

Some of the recipes suggest possible frustration. Many of the minor dishes would require a number of accessory ingredients which are in the nature of "trace elements" in the average kitchen. Mr. Heath exclaims: "Why not make *tripes à la mode de Caen*?" Why not, indeed, if besides the tripe, you can get the meat from one ox foot and one calf's foot, two or three pieces of the rind of pickled pork, a bouquet of parsley, thyme, and bay leaf, tarragon, celery, clove of garlic, a pinch of cayenne, a liqueur glassful of Calvados, and enough dry cider to cover the meat?

At the time of writing, correspondence in the columns of the daily press is being devoted to the best way to cook kippers, but no one seems to have thought of the method given on p. 49 of this book. "Put the kippers into a baking tin, skin side downwards, and sprinkle them rather thickly with grated cheese, adding a few shavings of butter or margarine here and there. Cook them quickly under a grill or in a hot oven so that the cheese melts and browns while the kippers are cooking."

This is the latest of twenty-six books on good cooking written by Mr. Heath and we admire his pertinacity. If he has induced even a small number of "good plain cooks" to produce something approaching the attractive dishes he describes, his task will not have been in vain. The reading of it has produced in our minds the firm resolve to sneak into the kitchen on a Sunday afternoon and try out some of the easier recipes.

* *Good Food Again*. By Ambrose Heath. Pp. 164. Faber and Faber, London. Price 10s. 6d.

The Milling Industry

Progress in 1950

A. J. AMOS, Ph.D., B.Sc., F.R.I.C.

IN OUR review of the milling industry for 1940 we commented upon the fact that because of the war millers were obliged to deviate considerably from accepted practices. As illustrations of these deviations we quoted the bulk buying of wheat by the Government, which meant that millers received their wheat supplies by allocation instead of by free choice on the open market; the necessity to mill to a prescribed rate of extraction; and the restriction of the type of flour to one grade. Although ten years have elapsed since that article appeared and the war has been over for five years, the milling industry still suffers from the same restrictions and, moreover, has to mill to a considerably higher extraction.

Wheat Supplies

Efforts have been continued to maintain the production of homegrown wheat at a high level, but, even so, it is necessary to import a major proportion of the wheat needed to meet our flour requirements. A large proportion of the wheat which was imported came, as usual, from Canada. It was the strong Canadian Manitoban wheat in admixture with homegrown wheat which formed the bulk of the grist. The other wheats which were imported during the year under review covered a wide range in baking quality; they included, on the one hand, Garnet, which approaches the poorer Manitoban wheats in strength, and, on the other, Soft White Pacific, which is as weak as English wheat.

Nowadays wheat is seldom bought from countries other than Canada, America, and Australia, but, during 1950, a small amount of French wheat was imported. Like most European wheats, this is a weak wheat of rather low protein content which is, in general, very much like English wheat.

If an informative picture of the wheat position throughout 1950 is to be presented, use must be made of numerical data. The data which have been selected for this article are those which throw light upon the three factors which govern the baking quality and blending potentialities of a wheat. These are protein quantity, protein quality, and diastatic activity. It is not proposed to consider, or to quote, data on attributes such as moisture content and bushel weight, which relate rather to milling behaviour than to baking behaviour.

Wheat Evaluation

The protein contents and the diastatic activities (reported as "maltose figures") quoted in the text have been determined by standard procedures, namely, the Kjeldahl process and the Rumsey procedure. The protein quality factor has been assessed by figures obtained by testing the flour milled from the wheat on the Alveographe. This modern, scientific, dough-testing instrument enables various physical properties of the protein of the wheat to be measured and to be recorded on a numerical basis.

A sample of each boatload of wheat imported into Great Britain is analysed in the author's laboratory, and the "average figures" quoted in the Table and in the text can, therefore, be accepted as trustworthy.

Canadian Wheats

Manitoban wheat from Canada is graded on the basis of soundness, cleanliness, plumpness, moisture content, and freedom from prohibited varieties. The best wheat is graded No. 1, and the quality deteriorates as the number of the grade increases. Six grades are provided for, but whether there is any significant quantity to be graded 5 and 6 depends very much upon the weather during the growing, ripening, and harvesting periods.

Most of the Manitoban wheat is designated Atlantic or Pacific (alternatively Vancouver) according to whether it is shipped from the Atlantic or the Pacific side. Usually the Vancouver wheat is inferior in baking behaviour and protein content to wheat of the corresponding grade shipped from the Atlantic seaboard.

The extent to which the Vancouver wheat is inferior to the Atlantic wheat varies from season to season according to the weather. If the rainfall in Alberta is above normal, while that in Saskatchewan and Manitoba is below normal, the difference between the two types will be increased.

Difference in Baking Quality

During 1950 the difference in baking quality between the Atlantic and Pacific arrivals of Manitoban wheat was appreciably more pronounced than usual, and indeed some of the poorer Pacifics were far removed from the accepted standard for Manitoban in strength. Some of these poor samples were no stronger than a good Plate wheat, and hence would rank no higher than a good "filler" wheat. Since bulk buying of wheat by the Government still continues, millers were unable to avoid, or even to limit, the use of Vancouver Manitoban, as they could, and would, have done had they been able to follow prewar practice and purchase their wheat on the open market. The result was that on occasions the unavoidable use of a high proportion of poor Vancouver Manitoban in the blend, together with a high proportion of weak English, led to the production of flour which was not up to the standard of baking quality which the baker has a right to expect.

Average data for the Atlantic and Vancouver Manitoban wheats received during 1950 are shown in Table I.

The wheat imported from Canada next in strength to Manitoban is Garnet. This wheat is

Row of conveying pipes on rollermill floor of mill equipped with low pressure pneumatic conveying system. The site glasses afford visual inspection of the conveyed stock.

significantly below No. 1 and No. 2 grades Atlantic Manitoban in strength, but during 1950 was as strong as the Vancouver top grades. The protein of Garnet wheat is less well balanced than that of good Manitoban, and the flour from Garnet wheat gives a dough which is inclined to be stiff and lacking in liveliness. The 1950 arrivals of Garnet gave as average data: protein 12·85 per cent.; maltose figure 2·20; stability 105; strength 59.

Durum Wheat

Another wheat imported from Canada during 1950 was Durum. This wheat belongs to a different botanical species and is widely used for the preparation of semolina intended for the production of macaroni. It is, however, also used as a component of the bread grist. It is much weaker than Manitoban wheat, and is no more than a "filler," *i.e.* it will not carry weaker wheats. The protein does not have pleasing characteristics, and the flour gives a very stiff and dead dough. The maltose figure is high. Average data for the Durum wheat imported during 1950 were: protein 13·44 per cent.; maltose figure 2·63; stability 106; strength 44.

Alberta Red Winter Wheat

A weak wheat, Alberta Red Winter, was imported from Canada during 1950. This wheat is not as strong as Durum and is considerably less proteinous. It is, however, appreciably stronger than English wheat. It is a useful wheat in blends designed for the production of "M" flour, *i.e.* flour intended for purposes other than breadmaking. The 1950 arrivals of this wheat furnished the following average data: protein 11·26 per cent.; maltose figure 1·65; stability 67; strength 36.

American Wheats

Two types of American wheat were imported during the year under review. One of these, Hard Winter, was very similar to Durum in strength but had a much better balanced protein. It was, however, appreciably less proteinous than Durum. Average data for the year were: protein 11·25 per cent.; maltose figure 1·76; stability 73; strength 42.

The other type of American wheat imported during 1950, Soft White Pacific, is, as its name implies, a weak wheat. In strength, protein content, and general nature it is very much like English wheat and could be used to replace it. Average figures for the year were: protein 8·88 per cent.; maltose figure 1·35; stability 44; strength 22.

Australian and English Wheat

The weak wheats in use in addition to Alberta Red Winter and Soft White Pacific were Australian and English. Much of the Australian wheat imported was little stronger than English wheat, but some arrivals from Australia, although not strong wheats, were certainly of good filler strength. In both types, however, and particularly in the latter, the tendency was for the protein to be rather stiff and somewhat lacking in life. The normal weaker Australian gave the following average data: protein 10·17 per cent.; maltose figure 1·46; stability 55; strength 23; while for the stronger type the figures were: protein 11·12 per cent.; maltose figure 2·05; stability 101; strength 47. It will be seen that, except for protein content, these latter figures closely approximate those for Canadian Durum wheat.

English wheat varies appreciably in quality, depending upon the variety and the district in which the wheat is grown, but the bulk of it is weak and low in protein content. It is well suited to the manufacture of biscuits, but is quite unsuited for the production of bread on its own. In a bread-making grist, however, it serves the useful purpose of acting

TABLE I

AVERAGE DATA OF ATLANTIC AND VANCOUVER MANITOBAN WHEATS RECEIVED DURING 1950

Grade.		*Protein Content (Per Cent.).*	*Maltose Figure.*	*Stability.*	*Strength.*
No. 1	Atlantic ..	13·75	1·85	106	73
	Vancouver ..	12·79	1·99	89	60
No. 2	Atlantic ..	13·53	1·80	101	71
	Vancouver ..	12·91	1·98	90	60
No. 3	Atlantic ..	13·04	1·85	98	67
	Vancouver ..	12·56	2·02	93	56
No. 4	Atlantic ..	12·96	1·97	111	69
	Vancouver ..	12·01	2·08	98	55

as a complement to the strong wheat so that a well-balanced flour of medium strength can be produced. Average data for 1950 were: protein 9·25 per cent.; maltose figure 1·44; stability 45; strength 20.

Wheat Grists

The wheat grists prescribed by the Ministry of Food varied from time to time, depending mainly upon the availability of home-grown wheat. The instructions about grist composition usually took the form of a declaration of a maximum for the proportion of Manitoban wheat and a minimum for the proportion of English wheat; the sum of these proportions often accounted for 90 per cent. of the grist, and for the remaining 10 per cent. the miller was permitted to use English wheat or imported wheat other than Manitoban. At times, however, the maximum proportion of Manitoban wheat and the minimum proportion of English wheat added up to 80 per cent., and of the remaining 20 per cent. half, *i.e.* 10 per cent. of the total, could be Australian.

The extent of the variation in make-up of the official wheat blends is illustrated by comparing grists in use during June and August. In the first of these two months grists contained 75 per cent. Manitoban and 15 per cent. English, whereas in August each of these wheats was present to the same extent at a level of 45 per cent.

It is obvious that changes of grist of this nature must be reflected in changes in the baking quality of bakers' flour; significant differences were encountered throughout the year in water absorption, protein content, strength, spring, and diastatic activity.

Rate of Extraction

The long awaited and long overdue reduction in the rate of extraction occurred during 1950. As from August 27, the official rate of flour extraction was reduced from 85 to 81 per cent. The reason for this rather odd level of extraction was that it had been calculated that home-milled flour at 81 per cent. extraction, plus the official quantity of admixed imported white flour, gave a mixture which was equivalent to an overall extraction of 80 per cent.

This flour of lower extraction was appreciated in all quarters except, of course, by the brown bread faddists. The whiter bread was welcomed by the general public, the improved liveliness and other dough properties were welcomed by the baker, and the possibility of once again obtaining the ordained rate of extraction without continually striving for the last ½ to 1 per cent. with probable loss of quality was welcomed by the miller.

In the author's opinion the benefits of a reduced rate of extraction could have been enjoyed well before the summer of 1950. The arguments usually offered by those opposed to a reduction in the extraction rate have been based upon dollar expenditure or nutrition, but for a long time it has not been possible to make a sound case on either of these grounds. It is true that at the lower rate of extraction slightly smaller amounts of some nutrients are retained in the flour, but in this connexion it is pertinent to recall that the levels of aneurin, nicotinic acid, and iron considered by the Conference on the Post-war Loaf to be desirable in flour are those which should be provided naturally if the rate of extraction were 80 per cent.

It is true also that a reduced rate of extraction calls for an increase in imported wheats, and hence a probable increase in dollar expenditure, but against this must be set the reduction in dollar expenditure on imported feeding-stuffs consequent upon the rise in the supplies of home-milled offals which would attend the production of a flour of lower extraction. The extra millers' offal furnished by a reduction in the rate of extraction is equal in weight to the extra wheat required to meet the lower extraction, and, since wheat is cheaper than some imported feedingstuffs, the overall expenditure might even be diminished.

The proportion of imported Canadian flour which the miller was required to incorporate in his home-milled flour varied from time to time during 1950, but was in the region of 10 per cent.

The Agene Problem

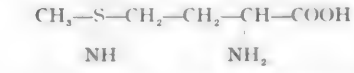
Following the publication by Sir Edward Mellanby in December 1946 of the finding that the feeding to dogs of a diet containing an abnormally high proportion of flour treated with agene (nitrogen trichloride) led to the development of signs of hysteria, the problem was intensively studied in several laboratories here and in America. It is pleasing to record that it was a British team of workers in the laboratories of the Research Association of British Flour-Millers who first isolated the

Row of conveying pipes on plansifter floor of a mill equipped with low pressure pneumatic conveying system. *Photos Henry Simon.*

compound, toxic to dogs, produced by the action of nitrogen trichloride on protein.

The announcement of the isolation of the toxic factor was made in September 1949. Work on the problem continued successfully, with the result that in January 1950 these workers reported upon the chemistry of the compound, stating that its formation involved a reaction with the amino acid methionine, and that it could be regarded formally as being derived from methionine sulphoxide by the addition of an NH group, or from methionine sulphone by the substitution of an NH group for an atom of oxygen.

A few months later these workers announced the synthesis of the substance by applying the Schmidt reaction to DL-methionine sulphoxide. They accorded the product the formula:



In January 1950, a statement was issued by a committee which had been set up under the chairmanship of Sir William Jameson, the Chief Medical Officer of the Ministry of Health, to consider the agene problem in all its aspects. This statement made the following points:

1. The Committee had been unable to find any evidence that agenised flour was in any way toxic to man, even when highly-treated flour was fed at high level.
2. Despite the findings under 1, the Committee felt that the use of agene should be discontinued in view of its deleterious effect on certain animals.
3. The Committee was satisfied that, if a loaf acceptable to the public was to be produced, an improver was essential, and they recommended, as a substitute for agene, chlorine dioxide, which, used at rates less than 30 parts per million, had had no ill-effects on animals or man.
4. This recommendation was acceptable to the Ministries of Food and Health and to the milling industry.

American Bread Standards

During 1950, the Food and Drug Administration section of the American Federal Security Agency announced its intention to make an Order relating to the definitions and standards of purity of baked products. This report followed a public hearing at which a substantial amount of evidence was given by interested parties. Three decisions contained in the proposed standards are of particular interest to the British milling and baking industries.

Persulphates are not to be permitted as bakers' improvers on the grounds that flour containing these salts had been the cause of the sensitisation of some of the persons handling it, and that frequent handling of such doughs caused allergic manifestations. In this connexion it has to be borne in mind that atmospheric conditions may well be a factor in the problem. In countries where the relative humidity is comparatively high, a sensitisation effect upon allergic subjects may make itself apparent, but in England, the continued use over 25 years of ammonium persulphate as a flour improver has not led to a significant increase in the incidence of bakers' dermatitis.

Softening and Anti-staling Agents

The other two decisions of particular interest relate to compounds proposed for, and indeed in use as, bread softeners and anti-staling agents. The mono- and di-glycerides of fat-forming fatty acids are to be permitted up to a limit of 25 per cent. of the amount of shortening used in the formula. The fatty acid esters of sorbitan (Spans), the polyoxyethylene derivatives of fatty acid esters of sorbitan (Tweens), and the polyoxyethylene derivatives of fatty acids, such as polyoxyethylene monostearate, will, however, be banned.

Developments in Milling Technology

In the last five years the pneumatic conveying of mill stocks has been introduced into a number of mills. On this system descending stocks still proceed by gravity, but those which require to be elevated are so conveyed by a current of air. It follows, therefore, that the system operates mainly on the conveyance of the stocks from the roller mills to the sieving machines which effect the separation of these stocks into the desired fractions. It is usual for the stocks from the roller mills to be conveyed by the air current along a horizontal pipe to the side of the building up which runs a vertical air pipe. At the top of this pipe the stock passes into a cyclone where it is separated and passed through a seal to the sieving machines.

The advantages claimed for pneumatic conveying in the flour mill are:

1. Cooling of the rolls and of the conveyed stock which makes for more efficient sieving.
2. Reduction in the dust content of the atmosphere and avoidance of sweating.
3. Reduction in infestation.
4. Reduced fire risk through the replacement of wooden spouting by metal.

Power Consumption

A disadvantage of the system has been its relatively high power consumption. The introduction of the system into a mill of medium capacity which previously had been an elevator mill would probably result in a net increase in power consumption of 2-3 horse power per sack of flour per hour.

Recently a firm of milling engineers devised a low pressure system of pneumatic conveying which would seem to retain the advantages which have been claimed for the high pressure system but which operates at a lower power consumption and is hence less costly. The power consumption of the low pressure system is in the region of one-third of that required for the high pressure system. It is claimed also that the low pressure system is more flexible.

BOOKS RECEIVED

Orders for any of the books listed below or reviewed in this issue may be placed with the Books Department, FOOD MANUFACTURE, 17, Stratford Place, London, W.1. It is regretted that under present conditions it is not always possible to supply books by return of post.

Methods in Food Analysis Applied to Plant Products. By M. A. Joslyn, M.S., Ph.D. Pp. 525+x. Academic Press, U.S.A. Price $8.50.

The Freezing and Cold Storage of Lobsters

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Torry Research Station (Department of Scientific and Industrial Research)

In 1948, 2,362,960 lobsters, valued at £432,499, were landed by British fishermen—about 62 per cent. in Scotland, the rest in England and Wales. The lobster fishery is thus of very considerable economic importance, especially to the inshore fishing community and to small holders in the Scottish Highlands and islands, where over 40 per cent. of the British catch is landed.

THESE districts are remote from the main markets, London, Glasgow, and the Midland towns, to which live lobsters are transported by road, steamer, and railway, the journey frequently taking some days. With careful packing, such as recommended in the pamphlet* issued by the Fishery Board for Scotland (now Scottish Home Department), it has been proved in practice that losses through death on the journey can be cut down to about 5 per cent. This is the exception rather than the rule, and as a recent Report† states, individual consignors using less efficient methods frequently experience losses of 20 to 25 per cent., and even losses of 50 per cent. at times during hot weather. Dead lobsters decompose rapidly and the meat when cooked shrinks, and is soft, spongy, and unpalatable. Lobsters must be cooked alive in order to obtain meat of good flavour and texture.

Lobsters are caught in greatest numbers between May and October. Demand, which is fairly steady from year to year, fluctuates seasonally, reaching its maximum in summer when catching is at its peak. At times supply outstrips demand, and reliable means of regulating the flow of lobsters to the market would greatly benefit the industry.

Preserving the Lobster

Short-term storage for some days is managed with very considerable success by keeping the lobsters with claws tied in slotted floating boxes or in special storage tanks.

Such storage is quite temporary, however, and does not serve sufficiently to regulate the supply to the market. For this purpose storage for three months, or longer, is necessary, and experiments in this direction are taking place.

It is clear that a suitable means of preserving the lobster in excellent condition for a number of months, *e.g.* by freezing and cold storage, would solve technically at least not only the problem of transport from remote places to the central markets, but also that of spreading a fluctuating, seasonal supply more uniformly throughout the year. The Committee already mentioned drew attention in its Report to some earlier work done at the Torry Research Station, Aberdeen, in which it was shown that frozen cooked lobsters would keep in good condition for some months at temperatures of about −10° to −20° F. (−23° to −29° C.). The following is a description of further experiments carried out during the past few years with a view to obtaining fuller data.

Experiment I (1946-47)

Frozen cooked lobsters and frozen live lobsters were stored for 0, 3½, and 7 months at −22° F. (−30° C.) and 14° F. (−10° C.).

Excluding 8 untreated controls obtained later in the experiment, 42 lobsters were used. These were landed at Mallaig in the early morning of June 1, 1946, and sent by rail at 9 a.m. to Aberdeen, where they arrived at 2.30 p.m. on the next day. Despite warm weather the lobsters were in excellent live condition and remained so until 10 p.m. before being cooked or frozen.

Weight varied from 472 to 962 g. (about 1 to 2 lb.), and the lobsters were graded by weight and spread evenly through the experimental lots. The quality of the lobsters was good.

Experiment II (1947-48)

Frozen cooked lobsters and frozen cooked and packaged lobster meat were stored for 4 and 6 months at −22° F. (−30° C.), −4° F. (−20° C.), and 14° F. (−10° C.).

Excluding 11 untreated controls obtained later, 61 lobsters were used. These were despatched from Kirkwall on October 20, 1947, by boat and received in Aberdeen at 10 a.m. next day. The lobsters, which were in excellent live condition and of good quality, were treated immediately after grading.

Weight varied from 301 to 1,343 g. (about ¾ to 3 lb.). Forty-four lobsters were stored whole, and 17 stored as packaged meat.

Cooking of the Lobsters

The lobsters — either alive, thawed, or frozen—were placed in two lots—smaller and larger sizes—in a metal basket and immersed in boiling salt solution (3 per cent.) for 15 to 20 minutes and 25 to 30 minutes respectively. The weight loss in cooking was observed.

The shells of live or raw frozen lobsters are a dark bluish green in colour, which turns on cooking to a red, varying from light to rather darker shades. This pigment change was apparently unaffected by previous cold storage of the lobster.

The tail and claws were broken off from lobsters after cooking as

* *Practical Hints for Lobster Fishermen* (1935). Fishery Board for Scotland (now Scottish Home Department).

† *Reports by the Committee on the White Fishing and Shell Fishing Industry* (1945). Scottish Council on Industry, p. 75.

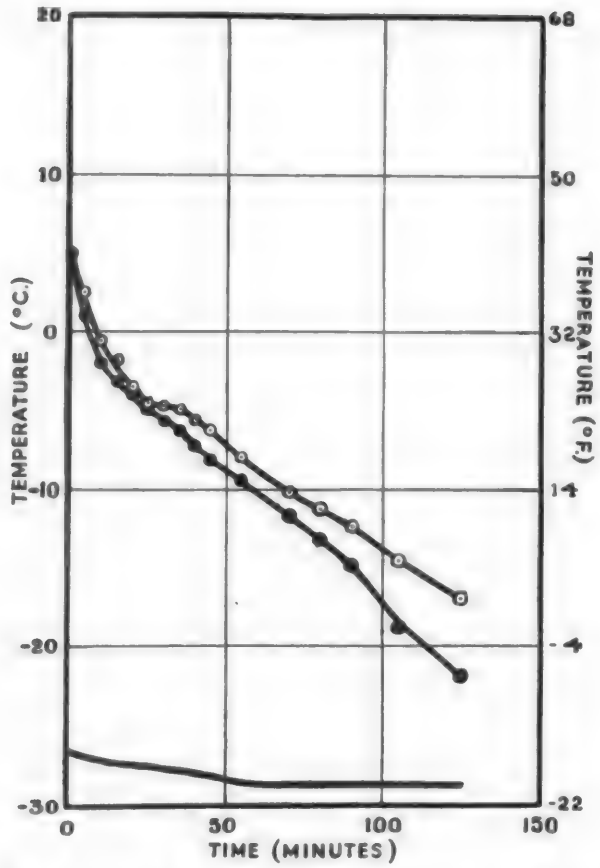


Fig. 1. Freezing curves of whole raw lobsters. —⊙—⊙— Thickness with tail turned under—3 in. —●—●— Thickness with tail turned under—2¼ in. ▬▬ Air blast temperature.

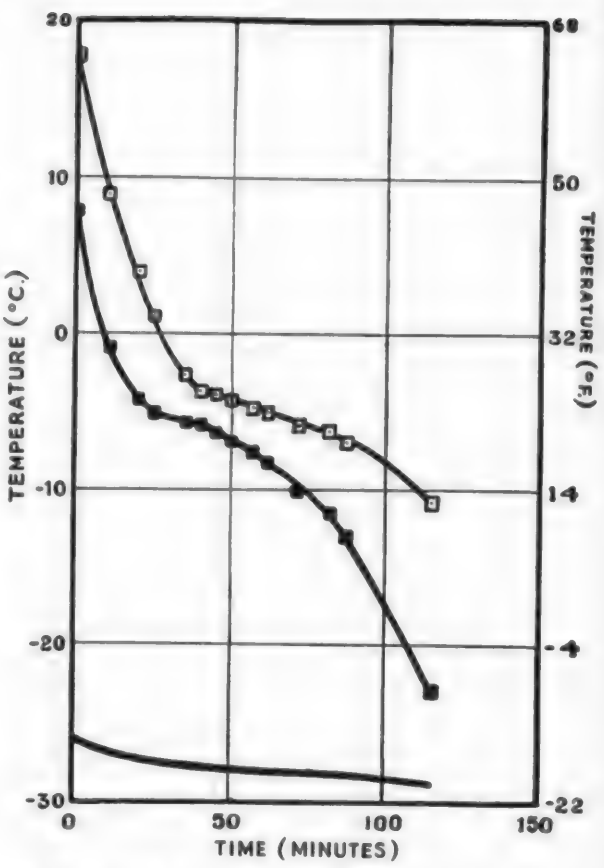


Fig. 2. Freezing curves of whole cooked lobsters. —◇—◇— Thickness with tail turned under—3½ in. —◆—◆— Thickness with tail turned under—2¼ in. ▬▬ Air blast temperature.

described. The meat was then removed whole from the tail with a fork, split open, and the intestine pulled out.

The colour of the superficial tail meat just beneath the shell is normally a somewhat darker red than that of the outside of the shell. The bulk of the meat is white, although in some females it has a pinkish tinge owing to diffusion of pigment from full ovaries.

The claws were cracked and the meat removed whole. The colour of the superficial claw meat just beneath the shell is pinkish and of somewhat lighter colour than the outside of the shell.

The meat from each lobster was packed into a waxed paper carton ($3\frac{1}{2}$ in. × 3 in. × $1\frac{1}{2}$ in.), which was wrapped in moisture-proof, heat-sealing, transparent wrapping.

The live lobsters, cooked lobsters, and the cartoned lobster meat were laid out singly on metal trays and frozen in a small air blast tunnel at a temperature which ranged from −15° to −20° F. (−26° to −29° C.) at an air speed of 12 feet per second.

Thermocouples were inserted in the centre of the thickest part of the tail, which was turned under the body, and freezing curves obtained (Figs. 1 and 2).

After freezing, the whole lobsters were each wrapped singly with waxed paper without sealing and were cold stored along with the frozen cartoned meat in wooden boxes.

Both live and cooked lobsters are very brittle when frozen and have to be handled most carefully to avoid claws, legs, and feelers getting broken off. Such breakages would perhaps not matter greatly in the case of the cooked lobsters, which are ready for shucking when thawed, but they would be more numerous in the case of uncooked lobsters, which would require to be handled and boiled together in fairly large numbers.

Examination by Tasting Panel

After storage, and cooking when necessary, the lobsters and lobster meat were examined by a tasting panel consisting usually of 17 members of the staffs of the Torry Research Station and the Marine Laboratory of the Scottish Home Department. Opinions were also sought from two members of the fish trade.

At each examination cooked fresh lobsters were used as controls.

In Experiment I, after 107 and after 231 days, a few control lobsters and thawed lobsters were kept at 32° F. (0° C.), wrapped in waxed paper, and examined again after 4 to 5 and 7 to 8 days.

The results of the experiments with particular reference to weight changes are now discussed.

Weight Losses in Cooking

In Experiment I, 34 live lobsters of weights ranging from 466 to 984 g. (average weight 721 g.)

were cooked as described. The losses in weight during cooking ranged from 5 to 23 per cent., with an average of 12 per cent.

In Experiment II, 72 live lobsters of weights ranging from 301 to 1,343 g. (average weight 655 g.) suffered losses in weight during cooking ranging from 7 to 24 per cent., with an average of 14 per cent.

These figures indicate the order of and the wide variation in cooking loss, which bore no relation to the size of the lobster.

Weight Loss in Freezing and Thawing

In Experiment I, 16 lobsters were quick frozen raw and 24 after cooking. In Experiment II, 44 lobsters were quick frozen after cooking.

During the overall freezing time of some 2 hours in an air blast at about −18° F. (−28° C.), the losses of weight in Experiment I for the live lobsters ranged from 0 to 2·3 per cent. (average 1·6 per cent.). For the cooked lobsters the losses ranged from 0·9 to 4·0 per cent. (average 1·5 per cent.).

In Experiment II, the losses ranged from 0·5 to 1·7 per cent. (average 1·0 per cent.).

Variation bore no relation to the size of the lobster; live and cooked lobsters behaved in similar manner.

On thawing frozen cooked lobsters, there was only a very small weight change on the whole—usually a loss, but occasionally a gain. Thus, in Experiments I and II the percentage loss relating to 54 lobsters was never more than 1 per cent., 40 of the fish actually showing small gains of less than 1 per cent., which is probably explained by condensation of moisture upon the thawing fish.

Weight Loss During Cold Storage

Table I shows the losses in weight that occurred in the stored lobsters in both Experiments I and II.

It is clear that raw and cooked lobsters behaved similarly with regard to loss of weight during storage. The figures illustrate well the increasingly beneficial effect of lowering the temperature of storage well into the range below 0° F. which is now recommended and is coming into increasing use for the storage of fish generally, not only on the ground of preventing loss of weight but also of conserving quality in many important respects. Even had the lobsters been hermetically sealed in absolutely moisture-vapour-proof wrappers, there would still have been considerable loss of weight, as well as loss of quality, at the highest temperature, for, since lobsters cannot easily be tightly wrapped, there would have been evaporation inside the package due to temperature gradients and condensation as ice on the inside of the wrapper. Although the package would not have lost weight, the fish would have done so. In fact, unless tightly applied, impermeable wrapping can be used, weight loss cannot be prevented at the higher temperatures, still so commonly found in cold stores, and even with perfect wrapping quality suffers in other ways at such temperatures.

Overall Loss of Weight

Cooking accounts for by far the major proportion of the loss in live weight. This is a normal and inevitable loss experienced in the fresh lobster trade by the caterer or consumer. The development of a trade in frozen—or for that matter, merely chilled—cooked lobsters sent as such from the ports, would require appropriate alteration in the price structure, since the expense of the cooking loss would then fall on the primary producer or on the port wholesaler.

These experiments on the freezing and cold storage of cooked lobsters have shown that if the low temperatures required to secure adequate preservation of quality are employed (see below), the extra weight loss involved in freezing, storage, and thawing in addition to that caused by cooking is comparatively small—as a rule about 1 or 2 per cent.—and unlikely to be a decisive costing factor.

Cartoned Lobster Meat

Seventeen lobsters were used, the weight of the cooked meat ranging from 79 to 213 g. (mostly from 130 to 180 g.) and constituting 24 to 30 (average 27) per cent. of the live weight. There was no loss of weight in freezing the cartons. After storage for 189 days, the whole cartons showed average losses of weight of 1·2 per cent. at −22° F. (−30° C.), 1·4 per cent. at −4° F. (−20° C.), and 2·5 per cent. at 14° F. (−10° C.). Clearly the wrapping and sealing had been imperfect.

The effect of the experiments upon the preservation of quality in the lobsters and the findings of the test panel are summarised as follows.

Raw v. Cooked Lobster

In Experiment I, 16 of the lobsters were frozen in the raw condition. Even on immediate thawing as well as after storage at 14° F. (−10° C.) and at −22° F. (−30° C.) for 107 and 231 days,

TABLE I

Expt. No. and Condition.	*Temp. of Storage °F. (°C.).*	*Duration of Storage (Days).*	*Loss of Weight (Per Cent.).*		*No. of Lobsters.*	*Overall Loss from Raw Material to Final Thawed Product (Per Cent.).*	
			Range.	*Average.*		*Range.*	*Average.*
I. Raw ..	−22 (−30)	107	0·0 to 0·7	0·2	4	15 to 40	27
	−22 (−30)	231	0·0 to 0·5	0·1	4	15 to 31	22
	14 (−10)	107	1·3 to 2·0	1·7	3	15 to 27	22
	14 (−10)	231	5·1 to 6·1	5·5	2	9 to 13	10
I. Cooked	−22 (−30)	107	−0·4 to 0·5	−0·1	8	7 to 29	15
	−22 (−30)	231	0·0 to 0·6	0·2	8	10 to 14	13
	14 (−10)	107	1·4 to 2·0	1·7	3	12 to 24	16
	14 (−10)	231	3·4 to 5·6	4·5	2	10 to 24	17
II. Cooked	−22 (−30)	126	0·0 to 0·3	0·2	8	7 to 17	13
	−22 (−30)	189	0·6 to 1·0	0·8	8	11 to 22	14
	−4 (−20)	126	0·3 to 1·1	0·8	8	11 to 22	17
	−4 (−20)	189	1·6 to 2·3	1·9	8	16 to 23	19
	14 (−10)	126	3·2 to 4·3	3·6	6	15 to 27	19
	14 (−10)	189	4·5 to 7·3	5·5	6	17 to 20	18

the flesh upon subsequent cooking was abnormally soft and shrunken and adhered to the shell, being difficult to remove completely without breakage.

This did not occur in the case of lobsters that were cooked and then frozen. For this reason all the fish used in Experiment II were cooked before freezing.

There is another factor, which to some extent supports precooking. Particularly at 14° F. (−10° C.), a temperature at which deteriorative change in flavour and texture readily occurs, but also noticeably at −22° F. (−30° C.) where such changes are greatly retarded, the flavour of the precooked lobsters was superior and more nearly normal than that of the raw lobsters. It seems probable that the difference may be due to the destruction of enzymes by cooking. It should be noted, however, that the flavour of the raw lobsters stored at −22° F. (−30° C.), although the poorer, was quite good even after 131 days.

Influence of Storage Temperature

The most striking effect disclosed in this experiment was, however, that of the temperature of storage. After 107 days at 14° F. (−10° C.), although the external colour of the shells had suffered no change, internal pigments covering tail and claw meat were a dull rusty, brownish red. Some desiccation of the flesh was noticeable at the pincer ends, some "drip" flowed under slight pressure, and the texture was noticeably spongy. The juices which exuded rather too freely upon chewing, had lost sweetness and had an abnormal, unpleasant flavour—particularly in the lobsters frozen in the raw condition.

After 231 days at 14° F. (−10° C.), the colour, texture, and flavour of all the lobsters were extremely poor. After the same period at −22° F. (−30° C.), the internal pigments were somewhat less bright than in the fresh controls, the texture was normal, and the odour and flavour of the flesh were slightly lacking in fresh sweetness. After 107 days at this temperature there was no detectable change in any of the lobsters due to storage.

Coded samples of frozen cooked lobsters stored at 14° F. (−10° C.) and −22° F. (−20° C.) for 107 and 231 days were examined by a commercial lobster merchant. On both occasions he readily noted the inferior quality of the shellfish stored at the higher temperature and the virtually fresh quality of these stored at the lower temperature.

Either freshly cooked control lobsters or well-stored frozen cooked lobsters after thawing were judged to have kept in very good condition for 4 to 5 days, and in quite good condition for 8 days, at a temperature fluctuating between 32° and 36° F. (0° and 2·2° C.).

Transport of Chilled Lobsters

Freshly cooked or thawed, well-stored frozen cooked lobsters apparently will thus keep in good condition for a few days at a chill temperature and even for a week in passable condition. The transport of chilled—rather than frozen—cooked lobsters might therefore be considered to offer an advantageous solution of the problem of distribution in certain circumstances. Indeed, as the Report* of the Scottish Council on Industry states, this method is at times employed to a limited extent in the trade, with results substantially the same as those just reported.

In Experiment II, a closer study was made of the influence of temperature of storage upon precooked, quick frozen lobsters, obtained from a different fishing area and at a different season of the year.

As before, there was no significant change in the external appearance even after 189 days' storage at the highest temperature, 14° F. (−10° C.). After 126 days, and more so after 189 days, at this temperature the superficial pigments of the tail and claw meats had become dull and brownish. Again some desiccation was noted at the pincer points of the claw meat. At −4° F. (−20° C.) these pigment changes developed more slowly, being only slight after 126 days. At −22° F. (−30° C.) change was still slower, the colour being normal after 126 days and only somewhat duller than normal after 189 days.

* *Reports by the Committee on the White Fishing and Shell Fishing Industry* (1945). Scottish Council on Industry, p. 76.

Changes in Texture and Flavour

At 14° F. (−10° C.) the meat in general tended to become greyish in colour, to develop "drip," and to become somewhat rubbery in texture in the case of the tail meat, and somewhat loose and spongy in the case of the claw meat. These changes all proceeded more slowly at −4° F. (−20° C.), being scarcely significant, however, after 126 days. At −22° F. (−30° C.) there was no detectable change even after 189 days. At 14° F. (−10° C.) odours and flavour were abnormal and unpleasant after 126 days and more so after 189 days. The aroma developed was described as "sickly sweet" and "cabbage like." After 126 days at −4° F. (−20° C.) odours and flavours had noticeably deteriorated and were of doubtful acceptability. They were definitely poor and unacceptable after 189 days. At −22° F. (−30° C.) they were normal after 126 days, and after 189 days, although slightly lacking in fresh sweetness, were still quite comparable with those of the control lobsters.

Examination by Trade Judges

Two trade judges examined coded samples after storage at all three temperatures; 14° F. (−10° C.) was definitely ruled out as a suitable temperature of storage. After 126 days at −4° F. (−20° C.) the flesh was considered to be somewhat dry and its flavour to be quite good but possessed of a slight storage tang. After 189 days, the lobsters were "poor" to "just passable."

After 126 days at −22° F. (−30° C.) the lobsters were considered to be excellent in every respect, and after 189 days, to be very good, although one judge noted some dryness in texture and some loss of fresh flavour.

The effect of temperature of

storage was as clearly evident in the experiment with quick-frozen, cooked, and packaged lobster meat. Deterioration followed the same lines with respect to appearance, texture, odour, and flavour as those just described, but was definitely more rapid than in the whole lobsters. Thus, at −22° F. (−30° C.) general quality was only "good" rather than "very good—normal" after 126 days, while after 189 days it was only "fair."

Conclusions

These experiments have shown that proper freezing and cold storage provide a technically possible means of putting before the consumer at any season lobsters of virtually unimpaired fresh quality, and thus of overcoming present difficulties in transport and distribution and in dealing with a fluctuating, seasonal supply.

The results indicate that it is preferable to cook the lobster before freezing and cold storage.

To retain a quality comparable with that of the freshly cooked lobster for about six months, it is necessary to store the shellfish at a temperature of, say, −20° F. (−29° C.). At a temperature of, say, −5° F. (−21° C.), the limit of satisfactory storage would appear to be about three months at the very most.

Storage at a temperature of, say, 15° F. (−9° C.) is not to be recommended. Deterioration in quality is so rapid at such temperatures that, except for the shortest temporary occasions, they should not be employed.

Frozen cooked lobster meat put up in packages appears to store less satisfactorily than the whole lobster. The storage life at −20° F. (−29° C.), for instance, should probably be taken at no more than about three and a half months. This requires further investigation, however, since packaging was imperfect in some respects.

THE work described in this paper was carried out as part of the programme of the Food Investigation Organisation of the Department of Scientific and Industrial Research. *Crown Copyright Reserved.*

Better Methods for Smoke-curing Fish

IN Great Britain kippers and bloaters are much more popular than fresh herrings. The traditional methods of smoke curing can make an attractive product, but they suffer from a number of disadvantages, the chief one being a lack of evenness in the cure. A mechanical kiln for the controlled smoke curing of fish devised at Torry Research Station is now being increasingly adopted by the fish trade.

Designed to control the temperature, humidity, density, and distribution of smoke, so that the desired degree of drying and smokiness can be obtained, the kiln possesses numerous advantages over the traditional type, the most important feature being the uniformity of the finished product. Kilns of several sizes, ranging from ¼ ton to 1 ton capacity have been designed, and ½ ton and ¾ ton models are described in a recently published leaflet* in sufficient detail to allow them to be constructed.

Smoke is produced by burning sawdust and chips in specially designed hearths in which combustion can be controlled, and is drawn into the kiln by means of a fan, situated on top of the smoking chamber, through which smoke is circulated horizontally, edge on to the fish. The smoke mixture is heated to the required temperature by thermostatically controlled heaters, and its humidity can be regulated by adjusting the proportion of fresh air drawn in. Uniformity of distribution is secured by a number of simple contrivances. After initial adjustment these contrivances should require no further attention.

The fish are hooked on sticks in the normal way and hung on trolleys, which are wheeled into the kiln. Smoke is cooled by the fish, and is reheated half-way along the chamber. Gradients in the batch of fish in the direction of the airflow are evened out by reversing the positions of the trucks of fish half-way through the process, or by a series of kilns comprising an alternating crossflow tunnel.

In addition to the advantages of uniformity and control, the smoking process can be speeded up within limits; less labour is required; the process is more pleasant and the product cleaner; and there are fewer losses owing to fish falling off the hooks.

* *The Torry Research Station Controlled Fish-smoking Kiln.* By C. L. Cutting, B.Sc., Ph.D. Food Investigation Leaflet No. 10. Pp. 16+ii. Published for the D.S.I.R. by H.M.S.O. Price 1s. 6d., by post 1s. 8d.

Pickles and Sauces

THE attraction of spiced products such as pickles, sauces, relishes, is accentuated in times such as these when austerity is the order of the day. Half-a-dozen bottles of different relishes used judiciously and, of course, at different times, will give at least a semblance of variety to the same old dishes.

The popularity of such products has unfortunately encouraged a good many entrants into this market and some inferior articles have been offered, although the more reputable manufacturers have adhered strictly to high quality.

The publication of a practical book* in which the author sets out to present new ideas and modern methods to established manufacturers, and also to initiate the beginner into the intricacies of pickle and sauce manufacture, is to be welcomed.

Mr. Poultney is a man of long experience, and claims that the recipes given have all been tested by him. The twelve chapters comprising the book are as follows: Vinegars; Ketchups; Relishes; Fruit Sauces; Savoury Sauces; Mayonnaise and Salad Cream; Chutneys; Brined Vegetables; Mixed Pickles and Piccalilli; Sweet Chopped Pickles; Seasonal Pickles; The Pickle Factory.

* *Vinegar Products.* By S. V. Poultney. Pp. 126. Chapman and Hall, London. Price 12s. 6d.

The Analysis of Oils and Fats

ALTHOUGH Dr. K. A. Williams has followed the original plan of the first authors in 1913, he has found it necessary to add nearly another 100 pages to the original work in order to allow full scope for revision and the interpolation of fresh matter in a book* which deals with the arrival of cargoes of raw products and the examination of the finished food, whether for human or other animals.

There are very few food chemists, and especially analysts, who are not concerned at some time or the other with the detailed examination of a sample of oil or fat from some particular food, and it is in this respect that the book is most valuable. The author starts, as previously, with instructions regarding sampling, and then details the points to be considered for thorough examination. These are summarised so well that they are worth quoting:

1. The object of the analysis.
2. The analytical methods to be employed.
3. The interpretation of the results obtained.
4. Typical analytical data for the substances dealt with, and descriptions of their sources and origin.

He then develops the whole volume on this theme, thereby departing to some extent from previous editions. If only students at college were taught these fundamental principles they would be much more useful in their immediate post-graduate and possibly later life. Only too frequently analysts think it is sufficient to give others the results of their analyses and to leave them to interpret them, instead of finding out the underlying reason for the work and supplying the answers to this.

When writing about analytical technique the author does much to debunk most of what the student learns at college about placing everything in desiccators, keeping the interior of the balance dry, and so on, but he does appear to overlook the advisability of keeping a mild desiccant in the balance case; not to prevent the formation of a film of moisture on the surface of what is being weighed, but to keep the balance dry and therefore less liable to corrosion. Similarly a little more guidance under the heading of interpretation of results, about the relative usefulness of different iodine and bromide determinations, when they should be carried out, and how to connect them together, would not be amiss.

Dr. Williams not only gives details of all recognised standard methods, but also the references to the original literature so that a busy works chemist knows where to look for probable sources of new and later information. For those concerned with frequent analyses this is valuable, but for those who are not often concerned with oil and fat analyses, it is generally advisable to possess a few good textbooks and to rely on these. Whatever the category of food chemist, it is safe to say that he should not be without this book, especially if much of the routine work has to be left in the hands of juniors. It possesses the rare distinction of being both a good laboratory companion and book of reference.

Congratulations should be tendered to the author on his method of presentation and to the publishers on the general layout of the book.—T. McL.

* *Oils, Fats, and Fatty Foods—Their Practical Examination.* By K. A. Williams, B.Sc., Ph.D., M.Inst.Pet., A.Inst.P., F.R.I.C. Third Edition. Pp. ix+500. J. and A. Churchill, London. Price 63s. net.

Food Composition Tables

WHEN the preparation of food balance sheets was first undertaken, it became evident that none of the existing food composition tables could be satisfactorily used to make valid and comparable estimates on a world-wide basis, because of differences in various countries and regions in the analytical methods employed for determining food composition, and in procedures for computing calorie and nutrient values. In particular, the use of two major systems for reporting carbohydrates and two or more procedures for computing calories, with various combinations of these, led to confusion. Other disparities in method also contributed to lack of international comparability.

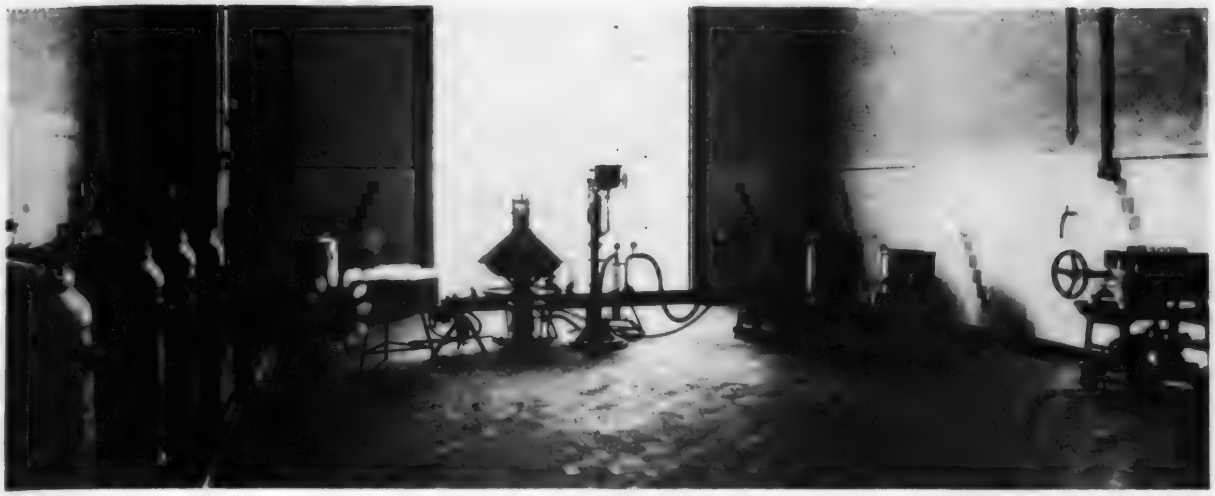
In order to facilitate the drawing up of such food balance sheets and to introduce a greater degree of uniformity, food composition tables* for international use have been drawn up. These give figures for the calories, water, protein, fat, carbohydrate, and ash in 292 foods, classified into twelve major food groups, using the methods recommended in the FAO Report *Energy-yielding Components of Food and the Computation of Calorie Values.* Table 1 covers calories, protein, and fat expressed in terms of the retail weight (as purchased); Table 2 gives the edible portion and refuse in the material as purchased. The bibliography comprises 158 titles.

It is certain that national food composition tables based on large numbers of analyses of foods locally consumed, and drawn up by sound methods, will give a more accurate picture of food composition in the country concerned than any set of internationally prepared tables. In the majority of countries, however, such tables do not exist at present, and, in their absence, the use of the present tables as a practical tool for the purposes described above appears to be justified and will develop accuracy and comparability in assessing the nutritive value of food supplies.

* *Food Composition Tables for International Use.* (FAO Nutritional Studies, No. 3, 1949). Prepared or FAO by Charlotte Chatfield. Pp. 58+vi. H.M.S.O., London. Price 5s. 3d.

Our Contemporaries

A REVIEW of advances in fuel efficiency and fuel research is contained in the December issue of *International Chemical Engineering.* This is an abstract of the address given by Prof. R. J. Sarjant, who was awarded the Melchett Medal for 1950 of the Institute of Fuel.



Department for the preparation of fruit juice.

An Italian Food Experimental Station

The main objects of the Preserved Foods Industry Experimental Station at Parma, which was founded in July, 1922, are to carry out research in connexion with the preserved products industry and to test new methods of treatment for the most suitable utilisation of raw materials and the exploitation of secondary products.

THE main functions of the Station are supplemented by others, such as to give advice on the subject of food preservation; to carry out analyses; to calibrate instruments and apparatus; to admit to its own laboratories young students and graduates intending to devote themselves to the industries for which the Station was established; to hold courses of instruction in theory and practice; and to publish an Official Bulletin containing information and reviews on matters of interest to the food preserving industry.

The Experimental Station is maintained by contributions from the Ministry of Trade and Industry and from the Parma Chamber of Commerce and the revenue from a tax on preserve manufacturers in proportion to salaries paid. It is directed by a Board which includes representatives of the contributing bodies and of the manufacturers.

Auxiliary Laboratories

The Station has at its disposal scientific and industrial laboratories. The scientific laboratories comprise the chemical, biological, canning and packing, bacteriological, and the agricultural salvage and industrial waste sections. Adjoining the scientific laboratories is the library, with a wide range of periodicals and books relating to the food preserving industry.

The industrial laboratories comprise sections dealing with the treatment of the tomato in its various derived forms, fruit and potherbs preserving, fruit juice, and experimentation. As an annex to the industrial laboratories there is a store with an experimental cold chamber.

Since its inception, the Experimental Station has found it necessary to develop a wide range of investigations owing to the fact

Experimental plant for dealing with fruit and vegetables.

Plant for the preparation of tomato products.

that until then no institute in Italy had been concerned with the technical problems peculiar to the preservation of foodstuffs. Activities therefore were devoted to the standardisation of plant for preparing tomato concentrate, in view of the importance attaching to this treatment and the considerable number of companies engaged in this industry. Thus a continuous chain of operations has been developed for the preparation of tomato juice, which is now used in the new plants. The evolution of the methods has resulted in a notable contribution to the standardisation of treatment. In juice preparation the Experimental Station has also introduced the seed-separating machine, which effects an improvement in the organoleptic character of the derived concentrates.

Among other matters which have been studied and dealt with in the industrial laboratories of the Station is the elimination of copper in all parts of machinery where this is possible without interfering with the processes.

The selection of tomato seed has been another subject of research. Many varieties have been tested under diverse rural conditions, as a result of which considerable quantities of selected seed are prepared and distributed to producers for cultivation.

Another section is equipped with various devices for preparing and preserving fruit juices. In this connexion numerous investigations have been made, both with the Matzka process based on the oligodynamic value of rare metals and with the Seitz-Boehi process. These investigations have been instrumental in evolving systems of treatment which do not alter the natural composition of the juices. The results have been brilliant from the scientific point of view, but practical application has revealed an obstacle in that the exacting requirements of operational control affect the cost of the final products.

Among the many subjects in which the agricultural salvage and industrial waste section is interested are the utilisation of mulberries, the dog rose, soft fruit, and the industrial utilisation of tomato skins, the by-products of which are used in the preparation of linoleum and lacquers for food cans.

In recent years the canning and packing section has been engaged on special research in connexion with the replacement of tin sheet by thin lacquered sheet, necessitated during the war years owing to the shortage of tin. These studies have had beneficial results in practice by rendering possible the satisfactory packing of products, particularly tomato concentrate and pulp.

The scientific and technical activities of the Station are summarised in the review *The Italian Preserving Industry* and are manifest in the continuous technical assistance given to the preserving industry in its various branches—vegetable, animal, fish, milk, soup extracts, and sauces.

Inside the microbiological laboratory.

Kenya's Canning Industry

KENYA CANNERS, whose cannery at Thika was opened by the Governor of Kenya last year, are concentrating on the production of canned fruit and vegetables of the highest possible quality at the lowest possible price levels. Quality is maintained by careful attention to the conditions of the raw material, and the cost is kept low by purchasing it on a large bulk scale and processing it as rapidly as possible by means of high-speed machinery imported from Great Britain and America.

A representative of the company works with officers of the Agriculture Department to supervise the supply of seed by arrangement between the company and growers, to plan the planting and cropping of fruits and vegetables on sound lines, and to advise growers on the gathering of crops at the right stage of maturity and their delivery to the factory in the proper condition and quantities required.

In addition, some seven hundred acres of land have been acquired for use as a seed trial testing farm, as well as for the propagation of pineapple planting material, which is unobtainable from sources outside East Africa.

Canned pineapple in various forms is the company's major pack. Careful directions are given to growers to ensure that only the most suitable fruit is sent to the factory, and that it arrives there in prime condition. The fruit is carefully sorted and examined on arrival at the receiving depot where any bruised or blemished pineapples are removed, and is checked again as it goes into the factory before being washed in rotary washers. Other machines remove the peels and cores at a speed of up to fifty pines a minute, after which the cylinders of solid fruit are cut into slices or rings on automatic slicing machines. The pineapple slices are fed on to a travelling inspection belt which is continuously flushed with running water, where the fruit is sorted and graded before filling into sterilised cans.

From the filling tables, the cans travel to a machine which automatically adds a sugar syrup, after which they enter a travelling steam-heated chamber for exhaustion.

Each can is double seamed at a speed of sixty cans a minute. At this sealing stage every can is marked or coded with letters and numerals, which gives the laboratory a check on each batch. The cans are then stacked in perforated metal crates and trucked into steam-heated cookers for sterilisation. After cooling, automatic labelling is carried out at a speed of up to one hundred cans a minute, followed by casing and steel strapping.

While pineapple slices or rings are being canned, titbits, juice, and crushed pineapple have to be dealt with, the machinery for preparing these varieties being entirely different from that for slices. Flesh which is left in the shells is mechanically cut away and used as crushed pineapple (popular in the confectionery and bakery trades). Broken slices, sorted from whole slices on the inspection belts, are sorted into stainless steel receptacles, cut into segments, and canned in the same way as slices, and labelled "Pineapple Titbits." The juice is extracted from the small pieces of fruit by crushing and squeezing in a high-speed mill, and strained before filling into cans. The peels, cores, and other waste are collected and sent back to the farms of the growers for use as cattle feed and fertiliser. The plumes or crowns—the green growth at the top of each pineapple—are cut away from the fruit and sent back to the farms for planting purposes.

During ordinary factory working hours, the present plant is capable of handling one hundred tons of pineapple a week, and this capacity is being stepped up in line with increasing production by growers.

The factory is equipped to can other products as well as pineapples; green beans, whole, sliced, or cut, can be dealt with at a rate of fifty tons a week.

Beans in tomato sauce is another line for which the factory is equipped. Choice hand-sorted white haricot beans grown in East Africa have been found to be eminently suitable for a first-class pack, but the tomato purée has had to be imported, as growers have as yet been unable to produce tomatoes of the varieties and in the volume required. For purée, whole tomatoes, and juice, the factory can absorb 1,200 to 1,500 tons in a season, and machinery has been installed to deal with these tonnages.

The canning line for pineapples at Kenya Canners.

News from the Industry

FORTHCOMING EVENTS

Royal Society of Arts

Cantor Lectures

Jan. 8, 15, and 22. (Three lectures.) "The Plastics Industry," John C. Swallow, B.Sc., Ph.D., of the British Plastics Federation.

*

N.U.M. Annual Conference

Lord Bruce of Melbourne is to be the guest of honour at this year's annual conference of the National Union of Manufacturers at Birmingham on January 22.

*

Royal Institute of Chemistry

The increase in numbers of Fellows, Associates, and Registered Students, reported in previous years, has been well maintained, it is stated in the 1950 report of the committee of the London and South-Eastern Counties Section of the Royal Institute of Chemistry.

The policy of holding meetings in areas outside Central London has been continued, and of the 37 meetings held during autumn 1949 and spring 1950, 29 have been outside London. Sixteen visits have been arranged during the year, applications for which have shown an increase of nearly 25 per cent. above the previous year's figure.

Most of the meetings arranged for Central London in the new programme will be held in hotels so as to encourage social contacts between members and the Section Officers.

The committee has noted with pleasure the appointment by Council of Honorary Institute Representatives in universities, colleges, and technical institutes, and is arranging to take the fullest advantage of these appointments to further the cause of Registered Students in Section affairs.

Meetings of the Section for the first part of 1951 are as follows:

Jan. 9. "Atomic Reactors—Their Development and Economics," J. Smith, B.A., A.M.I. Mech.E. (with the Gravesend and District Engineering Society). 7 p.m. at the Royal Clarendon Hotel, Gravesend.

Jan. 17. "Some Oxidase Systems in Flour," Prof. Harold Burton, Ph.D., D.Sc., F.R.I.C. (with the London Section and Food Group, Society of Chemical Industry). 6.30 p.m. at the Waldorf Hotel, Aldwych, London, W.C.2.

Jan. 23. Meeting at Slough; details to be announced.

Feb. 5. Meeting with the Alembic Club. 8.15 p.m. at the Physical Chemistry Laboratory, Oxford University.

Feb. 8. "Synthetic Liquid Fuels," C. C. Hall, M.Sc., Ph.D., F.R.I.C. 7.30 p.m. at Acton Technical College, High Street, London, W.3.

Feb. 16. "Corrosion Processes and Their Prevention," W. H. J. Vernon, O.B.E., Ph.D., D.Sc., D.I.C., F.R.I.C. 6.30 p.m. at Brighton Technical College.

Feb. 20. "Rational Chemotherapy," R. N. Rydon, Ph.D., D.Phil., D.Sc., A.R.C.S., F.R.I.C. 6.30 p.m. at Norwood Technical College, Knight's Hill, London, S.E.27.

Feb. 21. "The Biochemistry of Fat Absorption," Prof. A. C. Frazer, M.D., D.Sc., M.R.C.P. (with the Biochemical Society and Sections of the Royal Society of Medicine). 6.30 p.m. at the Royal Society of Medicine, 1, Wimpole Street, London, W.1 (subject to confirmation).

Feb. 24. "Luminescence in Inorganic Chemistry," C. G. A. Hill, B.Sc., A.R.C.S. 2.30 p.m. at the Zoology Lecture Theatre, Reading University.

*

Society of Chemical Industry

The following meetings are included in the 1950-51 syllabus of the London Section of the Society of Chemical Industry:

Jan. 15. Jubilee Memorial Lecture. "The Relation between Pure and Applied Science," Prof. H. R. Kruyt. 6.30 p.m. at the Royal Society, Burlington House, Piccadilly, London, W.1.

Jan. 17. "Some Oxidase Systems in Flour," Prof. H. Burton, Ph.D., D.Sc., F.R.I.C. (joint meeting with Food Group and London and S.E. Counties Section, R.I.C.). 6.30 p.m. at the Waldorf Hotel, Aldwych, London, W.C.2.

Jan. 22. "Friction and Lubrication of Solids," Prof. F. P. Bowden, Sc.D., F.R.S. (joint meeting with London Local Section, Institute of Metals). 6 p.m. at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

Feb. 5. "The Recovery of Bromine from Sea Water," Dr. R. O. Gibson, F.R.I.C. 6.30 p.m. at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

Mar. 1. "Some Applications of Microbiology to Analytical Chemistry," S. Price, B.Sc. (joint meeting with the London and S.E. Counties Section, R.I.C.). 7 p.m. at South-East Essex Technical College, Longbridge Road, Dagenham.

Mar. 5. "Properties, Production, and Uses of Streptomycin," W. B. Emery, B.Sc., A.R.I.C. (joint meeting with Fine Chemicals Group). 6.30 p.m. at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

Mar. 19. A special meeting at which selected papers recently published by the Society will be presented in abstract by the authors, followed by discussion. 6.30 p.m. at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

*

Society of Instrument Technology

Details of the main meetings of the Society of Instrument Technology, to be held at Manson House, Portland Place, London, W.1, at 6.30 p.m. for 7 p.m., are as follows:

Jan. 30. "The Machining of Small Instrument Parts," K. J. B. Wolfe and P. Spear, B.S.A. group machinability laboratory, Birmingham.

Feb. 27. "The Measurement of Surface Temperature," Dr. R. C. Parker, technical director, research division of Ferodo, Ltd.

Mar. 27. "Magnetic Amplifiers," D. A. J. Maddock, head of electrical and electric departments, B.S.I.R.A.

Apr. 24. "Human Control Systems" (arranged by Control Section), Sir Frederic Bartlett, professor of experimental psychology, Cambridge University.

May 29. Annual general meeting.

The following additional meetings will be held by the recently formed Control Section in the South Reading Room of the Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, also at 6.30 p.m. for 7 p.m.:

Jan. 17. Discussion on nomenclature, introduced by Dr. J. C. Evans.

Feb. 14. "The Design of an Automatic Spectrometer," G. G. Sutton. Discussion to be opened by Dr. E. R. Holiday.

Mar. 21. Details to be announced.

Traders' Road Transport

The trading and industrial community of Southampton has formed a local section of the Traders' Road Transport Association, the national organisation for "C" licence-holders. At the inaugural meeting, Mr. B. C. Wren, of Pirelli General Cable Works, was appointed chairman and a small committee was elected. Among subjects discussed were the proposed 30 m.p.h. speed limit for heavy goods vehicles; sign posting in London; the safe securing of loads; and the most effective way of dealing with unauthorised lifts in vehicles.

Other sections are to be inaugurated at Portsmouth and Bournemouth, and it is probable that these will be grouped under a South Coast sub-area, functioning under the London and Home Counties area.

Small-scale Homogenisers

Particularly adapted to meet the requirements of commercial users desiring a machine with a capacity of approximately 10 gallons an hour to handle small batches of emulsion, the Weir Junior homogeniser is also suitable for laboratory experimental work. It is of simple design, easy to dismantle and clean, and incorporates all the advantages of the larger models of the company. A Twin-Junior model, consisting of two standard Junior models coupled together on a suitable bedplate with the necessary interconnecting pipes and a common belt pulley, meets the needs of users requiring a homogeniser to handle 20 to 25 gallons an hour.

These models are described in two recent publications of the company; two other leaflets describe Baudelot water coolers for the dairy industry, and an ammonia compressor, one of a range of vertical totally enclosed uniflow type compressors operating on the dry compression system and particularly suitable for low temperature and quick freezing applications.

Quick-frozen Food Transport

Interest in quick-frozen food transport from the Continent is indicated in the work now in progress at Leith on two small cargo vessels which will incorporate low temperature holding space for the transport to Britain of quick-frozen food in addition to general cargo from the Continent.

Mr. W. Mumby-Croft, sales director, and Mr. R. Willey, technical director, of Berkley Hygienic Food Products.

Vibrating Equipment for Research

Vibration can effectively be used as a means of consolidating and packing materials of all sorts, and further uses for this type of equipment are continually being discovered. Of application in all aspects of research dealing with vibrational phenomena, the research type vibrating table, manufactured by Westool, meets a real need for experimental equipment in connexion with the packing of powders and granulated materials and the de-aeration of semi-fluid or fluid-solid mixtures. Constructed of welded steel units, the vibrating elements float on leaf springs, turned to resonance with the impulses from powerful electro-magnets.

Mineral Water Co.'s Centenary

Four generations of the same family have controlled the firm of mineral water manufacturers, Smith and Spencer of Redditch and Stratford-on-Avon, who celebrate their centenary this year. The founder was Mr. W. H. Smith, great-grandfather of the present managing director, Mr. W. E. Smith.

The Redditch headquarters of the business, which was started in premises only 12 ft. square, now cover more than one acre. There is a branch factory at Stratford and the firm also controls Space, Ltd., Leamington, and the Hopwood Springs and Mineral Water Co. In 1907 there was an amalgamation with Philip Spencer and Sons, also of Redditch, but the partnership was dissolved in 1918, the name of Spencer being retained in the business.

Council of Industrial Design

Another year of progress and of quickened interest in the design of British products is recorded in the fifth annual report of the Council of Industrial Design covering the year ended March 31, 1950.

The work of the industrial division, which has been increasingly concentrated on preparations for the 1951 Festival of Britain, and of the information division, whose purpose is briefly to stimulate a critical public demand for good design, is described in detail.

The year proved an important one for the Scottish committee of the Council. The survey of Scottish industry for the 1951 stock list was begun, and this afforded excellent opportunity for further strengthening the committee's relationship with many major industries.

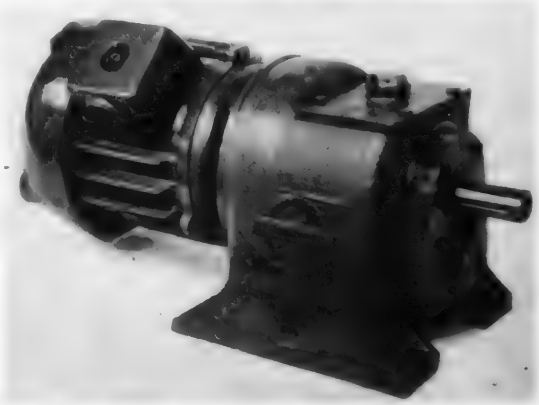
Geared Motors

For use in practically every industrial undertaking, the range of geared motors manufactured by Electropower Gears makes for an efficient and more economical production.

The gear box in general is of a one-piece casting of robust design, accurately machined to receive suitable flange mounting motors; gear wheels are of the spur type, and lubrication is by means of a splash system.

Shafts are carried on ample size bearings, and the units can be supplied in any voltage, A.C. or D.C., with drip-proof, totally enclosed, and flameproof enclosures.

The motors, which can be tropically rated to suit requirements, are particularly useful for all types of speed drives, such as food conveyors, machinery pumps, hoists, agitators, and where a slow speed is essential in a minimum of space.



The geared motor for use in all types of speed drives.

Fan Manufacturers Move

Owing to their need for increased office space, Woods of Colchester, an associate company of the G.E.C., have moved their London offices to: 58/62, High Holborn, London, W.C.1. (Telephone No.: Chancery 5474/8.)

The company have recently issued a publication covering their Aerofoil fan production. This brochure fully describes the range, with accounts of sound level ratings and performance characteristics, several pages being devoted to multi-rating selection tables. Details are given of starters, switches, and other products of the company.

Scots may fly Lobsters to U.S.

The Scottish Agricultural Organisation Society is at present investigating the prospects of flying Western Islands lobsters to the New York market.

In 1949 work began on lobster pounds in the Hebrides as a source of live fresh lobsters "on tap." Transport from these pounds has proved less easy than anticipated and later work was concentrated on large indoor sea water tanks at rail and airport terminals on the western coast. This proved satisfactory and live fresh lobsters were able to be flown to France.

Preliminary work suggests that the lobsters can be flown economically to America, and prices now ruling in the North American market will make this a possible development.

Let's Have a Party!

With the object of fostering an interest among the public in "fine drinking" generally, besides drawing attention to their particular brands, the three French houses of Ayala Champagne, Croizet Brandy, and Rocher Liqueurs have joined forces in producing an entertaining and informative booklet entitled *Let's Have a Party*.

The whole procedure involved in holding a party, whether it be a cocktail party or a supper party, from the issuing of invitations and catering to the departure of the guests, is described with the aid of illustrations, and a useful table shows how many glasses go to a bottle, and how many bottles to a person, or *vice versa*.

Copies of the booklet are obtainable from Blumenthals, sole concessionnaires for the United Kingdom.

Market for Tomato Sauces

Compiled from a report prepared by H.M. Minister (Commercial), British Embassy, Cairo, a memorandum on the market for tomato sauces in Egypt issued by the Commercial Relations and Exports Department of the Board of Trade states that concentrated tomato sauce is in considerable demand on the Egyptian market.

The extent of the demand, imports from the principal supply countries, prices, and packing are dealt with, and a list of firms suitable for handling United Kingdom canned tomato sauce is given.

Mr. C. J. Abbott, secretary of John Burgess and Son, Ltd., whose factory was described in the November, 1950, issue of "Food Manufacture."

Debt Recovery Legislation

As from October 8, 1950, the Courts (Emergency Powers) Act, 1939 (and amending Acts), together with the similar Acts relating to Scotland, came to an end.

This means that the ordinary enactments covering High Court, County Court, and other court judgments once again apply, and steps for the recovery of debts can now be taken without "leave of the Court" to do so being required.

The Liabilities (War-time Adjustment) Acts, 1941 and 1944 (relating to persons financially affected by war circumstances), also come to an end automatically, although they will still operate in cases where liability adjustment proceedings commenced, or any arrangement was approved, before that date.

Steam Raiser and Water Heater

A combined steam raiser and water heater with a maximum loading of 2 kW., designed mainly for use in farm dairies by the G.E.C., provides sufficient steam for a lagged sterilising chest up to 27 cu. ft. capacity and 3 or 4 milking clusters or cans. When conditions are not too severe, it will also serve a 2-unit recorder milking plant or steel utensils in an unlagged 27 cu. ft. chest. The water heater has a capacity of 20 gallons, and when diluted with a suitable amount of cold water, this will provide 25 to 35 gallons of hot washing-up water.

The heating system employed in the steam raiser is on the storage block principle, in which an iron block with embedded electrical heating elements is heated slowly over periods when steam is not wanted.

Heating of the storage block can be arranged for off-peak periods and the effect of power cuts minimised.

Wrapper for Rectangular Packs

Adaptable to products of various sizes, the wrapping machine for rectangular packs designed by Forsters Machine Company incorporates a number of patented features which enable necessary changeovers to be made in a few minutes.

Lead screw adjustments with pointer and scales provide setting positions for the magazine, cutting gear, and stacker. A quick release interchangeable roller assembly controls the length of film cut and plug-in units complete the end folding operations without loss of time. A toggle release mechanism automatically compensates reels of various widths. Side folders integral with longitudinal members are designed to cover the machine's range of packet height; for width the folders are adjustable bodily to setting gauges.

The packs delivered by the retractable head conveyors to the stacker are collated downwards to a delivery band. Heat sealing of waxed or cellulose film is done with equal facility by heaters controlled by energy regulators.

The machine is supported throughout its entire length on a box frame consisting of two compartments. The forward section houses the motor drive and clutch; the rear section, fitted with double doors, is equipped with shelves for accommodating all interchangeable parts.

Appointments

Major Montague Gluckstein has been elected chairman of J. Lyons and Co.

He started with the company nearly 50 years ago at the age of 14 in the Trocadero Restaurant kitchens.

Between the world wars he created "Nippy," the perfect waitress, and the advertising slogan "Where's George? Gone to Lyonch." He was one of the three Lyons chiefs at the Wembley Exhibition in 1924-5, providing 300,000 meals a day.

In 1939, Major Gluckstein was appointed honorary catering adviser to the Ministry of Food and he continued in this capacity until 1948. In the first world war he was given the task of reorganising army feeding methods. He introduced centralised cooking, and had expert cooks appointed and trained. He was awarded the O.B.E. for his work.

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Mr. M. Laybourne, until recently sundries buyer at the head office of British Fermentation Products, has joined the staff of S. Daniels and Co.

Revised Freight Rates

Increased operating costs and charges for handling cargo—especially in South American ports—have necessitated revision in Conference outward freight rates to Brazil and River Plate ports, it is announced by the United Kingdom/Brazil and River Plate Conference Lines. The revised rates will become effective in respect of shipments by vessels commencing to load on and after February 1, 1951.

Particulars of the revised freight rates may be obtained from any of the appropriate shipping lines, and exporters would be well advised to enquire, either direct or through their usual shipping and forwarding agents, for details as to how the proposed revisions will affect the goods they normally handle. They can then consider what amendments they will need to make to their c.i.f. quotations for goods to be shipped from February 1, 1951, onwards.

Change of Address

All departments of the head office of Shell Chemicals have now removed to Norman House, 105-9, Strand, London, W.C.2. (Telephone: Temple Bar 4455.)

The Commer 2 ton L.W.B. chassis with bodywork built by Pilot Works which has been supplied by Parker and Co. to Reads, manufacturing confectioners of Scunthorpe.

American-inspired Packaging

The production of artificial sausage casings and the conversion of packaging materials with special emphasis on the food trade are being carried out by Rival Packaging, a new venture of the Oppenheimer Casing Co. (U.K.), manufacturers of sausage casings.

The firm, whose ideas are based on American standards, have studied the handling of the new plastics in connexion with packaging; they have produced bags from both polythene and Pliofilm, and have developed printing on these materials to a high degree.

In view of the prospective need for cheap and effective methods for heat sealing films, the company have also produced two standard machines for heat sealing polythene which will enable the average trader to become "packaging conscious" without excessive outlay.

U.S. Appraisal of Merchandise

In order to facilitate the appraisal of merchandise by United States customs officials, all manufacturers and shippers who export goods to the United States are requested by the United States Embassy in London to forward direct to the Treasury Attaché, 1, Grosvenor Square, London, W.1, five copies each of current price lists and catalogues applicable to sales in the domestic market and for export to the United States. It is also requested that the Treasury Attaché be informed of any changes in these price lists as they occur. In case shippers do not issue price lists, it is suggested that current sales prices or quotations at the time of exportation be furnished.

In submitting such information, the following details should be given:

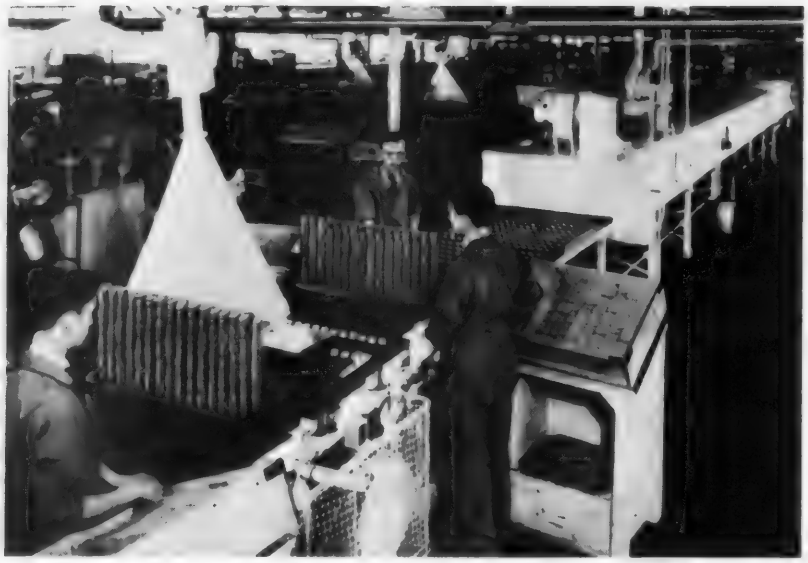
1. The date the new prices, discounts, and terms became effective.
2. Whether these prices apply to home market sales, or to sales for exportation to the United States, or both.
3. Whether these prices are freely offered to all purchasers or are restricted to certain classes of purchasers, *e.g.* wholesalers, retailers, an exclusive agent or distributor.
4. What charges are included in the selling prices, *e.g.* packing, containers, delivery.

This information will be promptly forwarded to the customs authorities in the United States and will generally be sufficient for immediate appraisal, avoiding delays in customs clearance, the filing of special bonds, and particular enquiries.

Gas in Design for Living

Since its official opening in October 1949, the Gas Council's permanent display "Gas in the Design for Living" has had an average of 1,000 visitors per month.

It is the Council's policy to change the display of gas- and coke-burning appliances at regular intervals so as to provide a wide field of selection and give facilities for the showing of the latest improvements. Among the refrigerators, solid fuel appliances, large-scale catering equipment, central heating and water equipment, lighting fittings, and space, portable, and overhead radiant heaters on show in the display recently reopened to the public are thirty appliances not previously included in this exhibition.



Operatives feed the magazines of the Peters sandwiching machine, which has improved the factory's output by 5,400 lb. of biscuits per day.

Marshall Aid Machinery

Among the firms who have taken advantage of Marshall Aid to increase their production and efficiency are W. and R. Jacob and Company (Liverpool) of Aintree, Lancs.; the sandwiching machine which creams and sandwiches their custard cream biscuits was bought under the scheme from The Peters Machinery Company of Chicago.

The biscuits are fed into the magazine which drops them on to a canvas belt. This takes each biscuit into the stencil plate where the cream is deposited; each then passes under another magazine which drops a second biscuit on to the cream, making a sandwich. Finally the sandwich is straightened up by a mechanical device, after which it passes under a presser bar and then into a cooler to set the cream.

The firm already had two of these machines, and since the installation of this latest model, which arrived from America in December 1949, their production has increased by about 5,400 lb. per day. Almost the entire output of this machine is exported, and it has released a large number of girls for employment in other parts of the factory where they are badly needed.

Packaging Works Extensions

Further extensions at the Cuffley Works of Autopack, Ltd., have been taken over by the Automatic Weighing and Packing Machine Co. to assist in meeting demands for their range of packaging, precision weighing, and filling machines.

Confectionery for the Canteen

Under the chairmanship of their hon. secretary, Mr. J. Easton, members of the Newcastle branch of the Industrial Catering Association recently attended a demonstration on "Confectionery Suitable for the Canteen," given by A. K. Ferrier and P. Conboye from the research bakery of Thomas Hedley and Co. at the premises of the North Eastern Electricity Board, Newcastle-on-Tyne.

Scottish Fruit Research

Plans for the creation of several Scottish research stations for horticultural work have been in hand for some time. The first to go into operation is a soft fruit research farm at Mynefield, Invergowrie, in Perthshire, which will be of major assistance in permitting research work on a commercial field basis. A director is to be appointed shortly and a programme of work will be arranged.

Canners' Exports Threatened

Scottish canners and packers are becoming increasingly anxious over the shortage of tinplate and the prospect that further cuts may be made. Export traders, and, in particular, herring packers, are drawing attention to the danger that their export earnings may drop as a result of such a cut. The situation is worsened by the fact that some canners are seeking to safeguard their future supplies by excess ordering.

Increase in Drivers' Wages

Notification that drivers' wages had been increased by 20 per cent., this rise being retrospective from October 28, was recently received without advance warning by Book Express, Ltd., from the Road Haulage Executive.

The company, who are obliged to contract their vehicles from the Executive since under the licensing laws they are not permitted to operate their own, have been forced to meet this rise by an adjustment in their scale of charges.

Service Van Scheme

For the benefit of users of their mechanical handling equipment, J. Collis and Sons have instituted a service scheme.

A van fitted up for periodic servicing of trucks, stackers, and Mota-Veyors at present covers London and the home counties, reaching as far as Bedford and Colchester. A depot in Warrington for service to their customers in the north will shortly be opened by the company.

Service calls are made according to the particular user's requirements, and can be arranged to take place fortnightly, monthly, or every three or six months.

Cake and Biscuit Alliance

The desire of the manufacturers to eliminate controls and regain their pre-war freedom is once again expressed in the report of the Cake and Biscuit Alliance (formerly known as the Cake and Biscuit Manufacturers' War Time Alliance) for the year ended June 30.

Three major controls remain—price control, allocations, and export. Price control is a barrier to the production of new lines and eliminates the true spirit of competition. The shortages of the three principal ingredients—fats, sugar, and dried fruits—are probably more linked up with the country's economic position than with the actual world shortages of these commodities, while the control of export would be unnecessary once the industry was again able to purchase its high-grade ingredients from pre-war sources.

The work of the Council in connexion with supplies of ingredients, the flour confectionery and biscuit industries, weights and measures legislation, resale price maintenance, and exports is fully described.

Pasteurisation Plant Orders

An order from the United Nations International Children's Emergency Fund (U.N.I.C.E.F.) for equipment for the pasteurisation of reconstituted milk powder for Malta has been received by the Creamery Package Manufacturing Company, now accommodated in new premises at Mitcham Junction, Surrey.

The company have also received an interesting order from a commercial undertaking in Hong Kong for equipment for the pasteurisation of fluid egg.

One of the firm's engineers will fly to Malta to supervise the installation of the new equipment, and it is expected that another trained engineer will travel to Hong Kong for a similar purpose when the fluid egg pasteurisation equipment is ready for installation.

Scales and Food Machines

A new combination machine incorporating a bowl cutter, 25 in. diameter, with their No. 32 mincer in a working height unit which will chop almost any kind of food to any degree required within a few seconds, was featured among the exhibits of Swift and Swallow at the Smithfield Show and Agricultural Exhibition held recently. The bowl cutter and mincer are independently powered and may be operated separately or together. Safety devices give adequate protection to the operator, and the mere unlocking of the bowl covers not only switches off the motor but applies a brake to the knives. Three hardened and grounded knives, revolving at 1,000 revolutions per minute, are quickly detachable for easy cleaning and may be reset together by means of a patent automatic control.

Also on show was an electric gravity feed slicer, a 2 lb. fully automatic fan scale, and a 14 lb. electric potato peeler, fitted with new tubular steel stand. An electrically illuminated 20 lb. fully automatic cylinder scale was the main feature of the Swift section of the stand.

Obituary

Mr. Frank Rowlands, chartered accountant, and chairman of Procea Products, on October 27, aged 51.

Mr. Rowlands was a member of the boards of numerous companies, including C. and E. Layton, Pathini Tea Company, Isa Bheel Tea Co., and Direct Aerated Water Supply Co.

Census of Production

REPORT ON PRESERVED FOOD TRADE

The Census of Production Preliminary Report No. 82 on the Miscellaneous Preserved Foods Trade relates to establishments engaged wholly or mainly in the manufacture of soups and soup powders, blancmange powders, cake mixtures, coffee essences and extracts, fish and meat pastes, vegetarian foods, etc., and in fish canning and flour blending, and which employed more than ten persons on an average during the year. Establishments in Northern Ireland are excluded.

It is estimated that about 98 per cent. of the total net output of the establishments for 1948 is covered by the returns which have been compiled for inclusion in this report. This trade corresponds to minimum list heading 162(6) in the Standard Industrial Classification, except that establishments wholly or mainly engaged in the manufacture of ice, which are included in this heading, have been dealt with separately.

Tables included in this report cover the values of production and of materials, fuel, and electricity used in 1948; stocks of finished products, etc., materials, and fuel; plant, machinery, and vehicles acquired and disposed of during the year; new buildings acquired; and details of employment, wages, and salaries.

South African Tender Board

The attention of United Kingdom exporters is drawn to an arrangement (details of which are published in the fourth annual report of the South African Standards Council) whereby the Union Tender Board will give preference to tenderers whose goods bear the South African standardisation mark or comply with South African standard specifications.

Details of these standard specifications may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1.

Food Factory Plans

Plans to reconstruct their factory at King's Road, Reading, Berks., have been prepared by Huntley and Palmers.

*

Extensions to the confectionery works of the Co-operative Wholesale Society at Eastcote Road, Stockport, Cheshire, are being made.

*

The erection of a new factory on a site at Bristol is proposed by Morrison Confectionery Co.

*

Plans are being prepared by C. Shippam, Ltd., of East Wells, Chichester, to erect a new factory and offices at an estimated expenditure of £100,000.

*

Extensions to the factory of Succulent Drinks, Ltd., at Sutherland Road, Walthamstow, London, E.17, are being planned.

Firm's Gift to "Thanks" Fund

A gift of £525 has been sent by J. Lyons and Co. to the Lord Mayor of London for the National Thanksgiving Fund.

Latest figures show that the Lord Mayor has received over £720,000, apart from money being collected by local committees throughout the country.

The chief aim of the Fund is to build a home from home in London for students from the countries which sent the food gifts.

Plant Analysis and Nutrition

Some 120 members of the East Malling Research Station Association met on November 22 to hear talks covering the work of the Biochemistry Section on mineral deficiencies. The director, Dr. F. R. Tubbs, who took the chair, repeated the plea made at the annual general meeting that members should assist in finding land for the national fruit trials by bringing possible sites to the notice of the Station.

The subjects of the talks included mineral deficiencies in trees, modern methods of mineral manuring, analysis procedures, and injection methods. Dr. A. E. Bradfield gave an account of the investigation that he and Dr. A. E. Flood were undertaking into the relation between the organic composition and the nutritional status of the plant, while the plant physiologist's approach to the problem was described by Dr. B. D. Bolas. After the summing up of the work described, a lively discussion took place.

BOOKLETS RECEIVED

The official organ of the Coffee Buyers' Association, *Coffee Trade News*, has for its object the stimulation of interest in coffee in the catering and other trades and among all concerned with dietetics generally. The November issue of this publication contains, among other items, an illustrated article on modern coffee roasting equipment, and an account of the world coffee supply position.

*

Some technical developments, personal news items, and an article on the application of the moving-belt principle to office work are contained in the first issue of *The News-Veyor*, an occasional publication of J. Collis and Sons.

Forthcoming issues are planned to contain accounts of the latest technical developments incorporated in the company's products, and new and interesting installations will be pictured and described.

*

The aims, policy, and benefits of membership of the Traders' Road Transport Association are outlined in their brochure, which has now been reprinted. The brochure points out that the Association stands for the preservation of a trader's freedom to operate his own vehicles, and that attempts to impose on trade and industry any form of restriction of this right to operate will be strenuously opposed.

The general policy of the Association is laid down as "the promotion and protection of the transport needs of trade and industry generally and in particular the preservation of the right of freedom to operate "C" vehicles and of an unfettered choice of any available means of transport."

COMPANY NEWS

A second interim dividend of 5 per cent. and a bonus of 10 per cent., both less income tax, making a total of 30 per cent. for the period April 8, 1949, to April 1, 1950, have been declared by the directors of Weston Foods in respect of the ordinary share capital of the company.

The total consolidated profit of the firm and subsidiaries amounts to £1,054,841 (against £942,875 last year), and after all charges and taxation there remains for distribution and appropriation £459,481 (against £423,037).

OBITER DICTA

• Is it the intention of this utility-minded Government to force utility sausages down the British people?—*Mr. John McLeod, M.P.*

• We are neither *führers* of fish nor commissars of cod.—*Sir Robert Lindsay Burnett, chairman of the newly created White Fish Authority.*

• There are three sorts of liars—plain liars, damned liars, and statistics such as your food shop comparisons of living costs in six nations.—*Correspondent to "Reynolds News."*

• Whether you like it or not, there is no escaping the fact that your product is *you.*—*Mr. J. B. O'Neill, speaking on "Helping the Retailer Develop Further Consumer Demand for Sausage Products" at the American Meat Institute's 45th annual meeting.*

• Would not you be willing to sell a sausage at 2s. 6d. to 3s. per lb. if the Ministry allowed it, instead of a sausage which a housewife has described as "a sort of thing that when you put it in a pan crawls out of its skin and disintegrates"?—*Mr. A. Hamperl, at the annual meeting of Meat Traders' Associations.*

• Why is it when the word "sausage" is mentioned there is always a smile. Our trade has been ridiculed many times by people who have no knowledge of our difficulties, and our product has even been mentioned as one of the hidden mysteries of nature and science. It is time the sausage trade sailed out of the doldrums of allocations and into the high seas of free enterprise.—*Councillor Geo. Moore at the annual dinner of the North Western Food Manufacturers' Association.*

• At the age of 14 my mother took me to a grocer's shop in Lancaster run by the father of the man who is now the President-elect of the National Federation of Grocers' Associations—Mr. Brian Smith. My mother asked Mr. Smith if he thought I would make a good grocer, but Mr. Smith decided that I hadn't got enough brains. In that, perhaps, Mr. Smith was quite right. Instead of becoming a grocer I have become the Minister of Food.—*Mr. Maurice Webb, speaking to the National Federation of Grocers' Associations.*

A group turnover of more than £23 million, 10 per cent. better than the record achieved last year, was announced by the chairman, Mr. George Wood, at the forty-seventh ordinary general meeting of Thos. W. Ward held recently.

Export trade had had a good year with an increase in turnover of 20 per cent. over the previous year.

After paying dividends on preference and employees' shares, and an interim dividend of 5 per cent., less tax, on the ordinary shares, the directors recommended a final dividend of 10 per cent. on the ordinary shares, making 15 per cent., less tax, for the year.

*

At a recent board meeting of J. Lyons and Company, the directors declared interim dividends on account of the year ending March 31, 1951, of 1s. per £1 unit on the ordinary and "A" ordinary stocks and one-fifth of this amount, *viz.* 2·4d., per £1 unit or share respectively on the proportional profit stock and "B" proportional profit shares, less income tax.

*

Presiding over the nineteenth annual general meeting of the National Canning Company, Mr. S. W. Smedley, chairman and managing director, announced that steps were being taken to centralise their farming activities. The farm purchased near Wisbech, together with that at Evesham and their Scottish farm, would now come under one management.

So far as canned and frozen peas were concerned, the season had been a favourable one, and he believed that the year's pack of canned and frozen foods was one of the best they had turned out.

There was growing evidence that the nature of public demand was changing; however, they endeavoured to adjust their activities to meet consumer requirements, and while there was some difficulty in obtaining adequate supplies of cans, all the signs pointed to another satisfactory year's trading.

The payment of a dividend of 20 per cent. was recommended. At an extraordinary general meeting subsequently held, resolutions were passed approving an increase in the authorised capital of the company to £750,000, and the capitalisation of part of the general reserves and the issue of the bonus shares to existing ordinary shareholders.

World Food News

New Fish Filleting Machine

In March 1951, the Dutch fishery trade will have at its disposal one of the largest fish filleting machines in the world. Designed and constructed by a German inventor, the machine is capable of working up twenty large fish into fillets within a few minutes. Only six machines of this type will be made, one of which will be handed over to the Netherlands (on hire terms exclusively) provided that the whole Dutch fishery branch may make use of it.

Dearer Sugar in S. Africa

The producers' price of sugar in South Africa has been increased as from November 1, 1950, by approximately 3s. 4½d. per 100 lb. and the retail price has been increased accordingly by ½d. per lb. The prices of sugar have remained fairly constant over many years and the present increase will result in the marketing of sugar at the highest level ever recorded in the Union, although the producers maintain that their price is still far below that of the world market.

Fish Cannery for Argentina

According to reports from Puerto Deseado, in the Argentine Southern Territory of Santa Cruz, a Norwegian technician is at present studying the possibilities of establishing a fish canning factory there on behalf of Argentine financial interests, who, it is reported, are willing to invest up to twelve million pesos in the installation of a modern packing plant.

In view of the abundance of fish off its coasts, Puerto Deseado might, in time, become as important a fishing port as is Mar del Plata—where some six or eight canneries produce a considerable part of the country's requirements. It is anticipated that once the Puerto Deseado factory enters into production, Argentina will be in a position not only to cater for her own requirements, but also to export canned fish to neighbouring countries.

The preliminary plans provide for the employment of Argentine workmen at the new factory under the supervision of Norwegian technicians who would be contracted specially for the purpose.

Bacon Manufacture in Ireland

The Government of the Republic of Ireland have withdrawn the restriction which was imposed in 1942 on the slaughtering of pigs and curing of bacon by licensed bacon curers and registered pork butchers on behalf of other persons.

The right of pork dealers to manufacture bacon has not been altered in any way; pork dealers may manufacture bacon, as heretofore, only in accordance with the Curing Order.

Plastic Ware Preserves Food

Made from a blend of polyethylene and polythene, Tupperware, produced by the Tupper Corporation, Massachusetts, is a translucent plastic tableware which is unbreakable and does not chip or crack.

The 5 oz. canister has been created to provide a container into which the contents of a tin of juices can be decanted and kept wholesome for longer periods than if left in the can. The patent air- and liquid-tight cover combination provides the means of decanting from the canister without removing the entire top and so permits only a minimum amount of air to contact the contents while pouring. To avoid spilling fluid on the top of the canister, pouring is started with the small orifice at the top of the brim and then the canister is rotated away from the body.

The Tupperware bread server is capable of keeping a loaf of bread fresh and wholesome for as long as 6 to 8 days. It will keep cake and sandwiches fresh as well as preserving meat loaves, and can also be used for maintaining vegetables in a moist condition.

Fish and Chips in Holland

By the joint activities of the Industrial Group of Fishery Products and the Fish Department of the Netherlands Food Council, two fish and chip plants will be erected, one at The Hague and one at Amsterdam.

This move is aimed at encouraging general acceptance of this well-known British dish and increasing sales of fish fillet. In time, both experimental plants will be passed over to private interests.

Bechuanaland Projects

The Colonial Development Corporation is to start work on two major development projects in Bechuanaland—a cattle ranch on the Chobe Crown Lands in Northern Bechuanaland, and an abattoir and freezing plant at Lobatsi together with a holding ranch on the Molepole Crown Lands in Southern Bechuanaland.

The first scheme is planned to take some 18 to 21 years to complete, by which time it will cover an area of 16,000 square miles. 500,000 acres in the rain belt will be cultivated with a view to providing additional feedingstuffs and also eliminating the present serious grain deficit in the Protectorate. When the project is fully developed it is planned to carry a very large number of cattle with an annual offdraw of over 50,000 head.

The Lobatsi abattoir, together with the freezing plant, will provide up-to-date marketing facilities for Northern Bechuanaland cattle, the major industry of the Protectorate, while the holding ranch will ensure a steady throughput of cattle in good condition as opposed to the older methods of marketing poor cattle on the hoof at indefinite periods. The abattoir is designed to handle at least 70,000 head of cattle per annum when in full operation.

Cocoa and Chocolate Production

RECOVERY OF WEST GERMAN INDUSTRY

West German cocoa and chocolate production is again sufficient to meet domestic demand, according to German cocoa producers. There are about 90 large factories engaged in processing cocoa from the bean to the finished product, and many smaller firms carrying out individual production stages. The orders at present on hand will keep the industry busy until June or July.

Some of the old-established firms have resumed production under licence from Swiss firms such as Nestlés and Cailler. Several chocolate factories were transferred from the Soviet zone to Western Germany after the end of the war.

No production figures are available, but some indication is given by imports of raw cocoa, which amounted to 88,756 tons between January 1 and September 30, 1950. Of this total, 4,140 tons were imported in August and 7,520 tons in September. During the nine-month period, 15,782 tons of cocoa products were also imported—1,716 in August and 1,730 in September. Chocolate imports were 5,371 tons during the first half of 1950, and came from Holland, Sweden, U.S.A., Switzerland, Denmark, Czechoslovakia, Belgium, and Britain.

Despite the substantial increases in world prices of raw cocoa, West German prices have remained stable and it is expected that they will continue so.

The supply of raw materials is regarded as adequate. Cocoa is on the German free import list, and prices for imported raw cocoa range from 480 to 500 D-marks per 100 Kg. A temporary shortage of sugar in July and August did not seriously hamper production. Milk supplies present no difficulty, but German producers fear there may not be sufficient imports of dried fruits and almonds, in which case the production of certain kinds of chocolate and confectionery will have to be reduced.

The halting of liberalised chocolate imports from Britain was greatly welcomed by German producers. The latter emphasise that large quantities of quota imports have still to be taken up under trade agreements, especially from Sweden, Holland, and Switzerland. Illegal imports of chocolates are also worrying the industry.

Exports of chocolate and processed cocoa in the first half of 1950 were negligible, amounting to less than 10 tons.

OVERSEAS ENQUIRIES

Vinegar Plant

The First Secretary (Commercial) to the British Embassy at Tehran has advised that Mr. Roman Issayeff, an important Persian financier and industrialist, wishes to purchase a complete plant for the production of approximately 220 gallons of malt vinegar per day.

The enquirer is understood to be purchasing a complete brewery to meet the local demand for beer and will doubtless supply from the brewery the raw materials required for the production of vinegar.

United Kingdom manufacturers who can supply malt vinegar plant are invited to send full details, including prices, delivery dates, and any available literature direct to Mr. Issayeff, c/o Iran Motors, Avenue Saadi, Tehran.

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Smoked and Salted Fish

A report has been received from the British Consulate General, 1022, National Bank of Commerce Building, New Orleans 12, Louisiana, to the effect that the O. P. Montagnet Trading Company, 206, Board of Trade Annex, New Orleans, Louisiana, would be pleased to receive quotations in respect of smoked bloaters, herrings barrelled in brine, and dried salted codfish.

Quotations should be in United States currency on the basis of c.i.f. Haiti. Terms of payment would be by sight draft payable on arrival of the goods, and the O. P. Montagnet Trading Company have requested that a 10 per cent. commission be included in the quotations.

*

Confectionery and Biscuits

The British Consulate General at Houston, Texas, has advised that the Corpus Christi Export-Import Co., Inc., P.O. Box 633, Corpus Christi, Texas, are interested in obtaining the agency of United Kingdom manufacturers of chocolates, biscuits, sweets, bon-bons, and similar specialities.

United Kingdom manufacturers who are interested in this enquiry should forward prices, in dollars, c.i.f. Houston, and, where appropriate, samples, direct to the Corpus Christi Export-Import Co., Inc.

The British Consulate General at Boston has reported that Charles N. Miller Co., of 100, Massachusetts Avenue, Boston, 15, are interested in obtaining the agency of a United Kingdom manufacturer of confectionery. The particular interest is in chocolates and toffee, but the firm are ready to consider a more comprehensive range of confectionery products.

United Kingdom firms who are interested in this enquiry should communicate direct with Charles N. Miller Co. (for the attention of Mr. D. A. Stevens, sales manager), providing trade literature and quotations, in dollars, on a c.i.f. basis.

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Canned and Packaged Products

The office of the Commercial Attaché at the American Embassy report that R. C. Williams and Co., Inc., of Tenth Avenue, 25th to 26th Street, New York City, N.Y., U.S.A., wish to contact manufacturers and exporters of packaged and canned products who are interested in export to the United States.

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Steam Jacketed Pans

The British Consulate General at Chicago has advised that the Aaron Equipment Company, 1347, South Ashland Avenue, Chicago, 8, Illinois, have expressed an urgent interest in securing quantity supplies of stainless steel jacketed pans from the United Kingdom. Particular interest attaches to models having a capacity of between 80 and 200 gallons, suitable for use in the food and chemical processing industries.

Interested United Kingdom manufacturers are invited to communicate direct with Mr. L. R. Rubin, of the Chicago company, giving quotations in dollars c.i.f. Atlantic Coast port, delivery dates, and any available literature.

Indian Oil Extraction Research

A report issued recently by the Indian Institute of Science, Bangalore, states that work on the solvent extraction of vegetable oil is in progress. In particular, the extraction of castor seeds and cake with cheap solvents and the economic possibilities of this process in India are being investigated.

Argentine Livestock Institution

Both the National Meat Board and the Argentine Meat Producers' Corporation, which directly represented stockbreeders, are being absorbed in the newly created Argentine Livestock Institute which is to be domiciled in Buenos Aires.

The Institute will control all stages of meat production, distribution, and consumption, regulate the standardisation and classification of cattle, fix prices, intervene in the activities of meat-packing plants, determine production quotas for the home market as well as for export, and organise sales both in the Republic and overseas. Moreover, the Institute will take over the functions of the stockbreeders and rural societies, as, for example, in the taking of measures for the improvement of stock.

The law establishing this Institute provides for a tax, amounting to 8 per cent. of the amount received from home and export sales of cattle, sheep, and pigs, to be paid by stockbreeders. Thirty per cent. of the proceeds of this tax will be used as a contribution to the resources of the Institute, and the remaining 70 per cent. will form a Fund of Livestock Defence which may be utilised to provide capital for the Institute.

Norwegian Floating Trade Fair

Arrangements for a Norwegian "floating trade fair," which is to tour the Mediterranean on board the liner *Peter Wessel* at the beginning of this year, are now being completed. Over 40 firms have reserved stands on board the ship which will call at a large number of ports in France, North Africa, Italy, and the Near East. Among Norwegian export products to be shown will be fish products and chemicals.

Jersey Firms Change Hands

Several businesses in Jersey have recently changed hands.

The old-established business of A. E. Smith and Son has been acquired by the Eldorado Ice Cream Co., who will extend the premises at 7, Cannon Street, St. Helier, from which they will operate in future. They have recently installed a cold store on Guernsey where stocks of their products may be kept to draw from as required.

A. E. Smith and Son will continue in business and will concentrate on the manufacture of aerated water and soft drinks. They have, in turn, recently bought the trade in these lines previously carried on by De Gruchy and Brasford.

Lyons International Fair

The Lyons International Fair is to be held from March 31 to April 9, 1951. Exhibits will cover 1½ million sq. ft., and there will be sections devoted to food and chemicals, industrial vehicles, and agricultural machinery.

Dutch Whaling Expedition

The board of the Netherlands Whaling Company is studying a project to use Marshall Aid funds for the equipment of another whaling expedition to the Antarctic, it was announced at the recent annual meeting. The company have equipped one expedition since their foundation shortly after the war; this consists of the whaler *Willem Barendsz* and a number of catchers at present on their way to the Antarctic.

The board told shareholders that another expedition would require large investments and it was therefore impossible to tell when and whether the project could be carried out.

A larger supply of Dutch-produced whale oil, it was stressed, would be in the interest of Holland's foreign exchange position and margarine output.

News from the Ministries

Tea Subsidy

The trade associations concerned have been advised that from the date of the opening of the London Tea Auctions on April 2, 1951, a flat rate subsidy of 1s. per lb. will be paid in respect of all teas for home consumption. It is intended that existing controlled retail prices of tea shall be continued for at least one year and that, subject to the maintenance of present prices, the rate of subsidy shall be continued for the same period.

Confectionery and Cocoa Products

Chocolate confectionery, sugar confectionery, and chocolate couverture may now be imported from Western Germany under the block licensing arrangements announced in December 1949.

No alteration is necessary to block licences already held by importers. Unless already submitted, samples of chocolate and sugar confectionery and chocolate couverture, together with the manufacturer's name and address, should be sent to the Bakery and Confectionery Division, Ministry of Food, London Road, Stanmore, Middlesex, to whom enquiries about these arrangements should be directed.

Fruit Content of Jam

The Food Standards (Preserves) (Amendment) Order, 1950, made in June last raised the minimum fruit content of certain jams. The Order came into force on September 25 for sales by manufacturers, but the dates of operation for sales by wholesale and retail were to be fixed later.

The Minister of Food has now made the Food Standards (Preserves) (Amendment) (Commencement) Order, 1950, appointing January 25, 1951, and May 25, 1951, as the operative dates for sales by wholesale and by retail respectively.

Flour Milling

Grists for breadmaking in England and Wales were altered on November 18, 1950, as follow:

	Per cent.
Home-grown wheat (minimum)	35
Manitoba and/or American springs wheat (maximum)	45
Australian wheat (maximum)	10
Other imported wheat as available	10

There is no restriction on the use of Australian wheat in grists for purposes other than breadmaking.

No alterations have been made in the grists for Scotland and Northern Ireland.

From that date also, the rate of admixture of imported flour was reduced from 10 per cent. to 7½ per cent. in all mills in England and Wales, and from 15 per cent. to 12 per cent. in all mills in Scotland and Northern Ireland. As before, these percentages relate to the total product containing admixed flour.

Prices of Stockfeed Potatoes

The Stockfeed Potatoes (Maximum Prices) Order, 1948, as amended, has now been revoked. The chief effect of the revocation, which took effect on November 12, is to free stockfeed potatoes from price control and to make it unnecessary for growers to obtain licences to sell potatoes for stockfeed.

Growers and traders are reminded that:

1. The Ware Potatoes Order, 1950, prohibits the sale or use (including processing) of stockfeed potatoes for human consumption and permits only ware potatoes to be sold or used for that purpose.
2. The Seed Potatoes Order, 1950, prohibits the sale or use of stockfeed potatoes for planting and permits only seed potatoes to be sold or used for that purpose.

Imports of Marzipan

Arrangements have been made for a limited quantity of marzipan to be imported from Belgium and Luxembourg under individual licence.

The marzipan will be imported through normal trade channels. Applications for import licences should be made in duplicate on the usual form ILD/A, obtainable from the Board of Trade, Import Licensing Branch, Romney House, Tufton Street, S.W.1, and from the usual Customs Offices. For administrative convenience, completed application forms should, in the first instance, be submitted to the Bakery Division of the Ministry of Food, London Road, Stanmore, Middlesex.

The marzipan to be imported under these arrangements should consist solely of ground almond kernels and sugar and the almond kernel content must be at least 20 per cent. The unqualified description "marzipan" may be applied only where the percentage of almond is not less than 66⅔ per cent. In all other cases the word "marzipan" should be qualified by the addition of the actual percentage of almond kernels in the mixture, *e.g.* marzipan (40 per cent. almonds).

Applications for import licences should be endorsed with the following information:

(*a*) Prices f.o.b. and c.i.f.
(*b*) Composition of the marzipan, *i.e.* percentage of sugar and almond kernels.
(*c*) Type, size, and weight of pack.

Starch Food Powders

The Starch Food Powders (Control) Order, 1944, as amended, has been revoked with effect as from December 3, 1950. Licences are now no longer necessary for the manufacture, blending, or prepacking of starch food powders (cornflour, custard powder, and blancmange powders).

The sale, purchase, and use of the starches contained in these products continue to be controlled under the Starch and Dextrine (Control) Order, 1948.

Meat Products from W. Germany

An official certificate under the Public Health (Imported Food) Regulations has been recognised for meat products (including canned ham) imported from Western Germany. The present certificate relates to England and Wales only; the question of similar certificates applicable to Scotland and Northern Ireland is under consideration.

Traders in England and Wales will now be able to import certain meat products and canned ham, canned cooked gammons, and canned cooked shoulders from Western Germany, under open general licence, in accordance with the arrangements previously announced by the Board of Trade.

Imports of Biscuits

As from November 20, 1950, Western Germany and Israel have been added to the list of countries from which biscuits may be imported under the block licensing arrangements previously announced.

The necessary arrangements have been made with H.M. Customs and Excise. Importers who already hold an appropriate licence of the O.B.1. Series will be allowed to import biscuits from these sources without amendment to their licences.

Importers who are not already in possession of the appropriate licence but who wish to share in these arrangements should submit an application (in duplicate) on Board of Trade form ILD/A, which may be obtained from the Board of Trade, Import Licensing Branch, Romney House, Tufton Street, London, S.W.1, or from the usual Customs Offices. For administrative convenience, importers are asked to send applications to the Board of Trade through the Ministry of Food, Bakery Division, London Road, Stanmore, Middlesex.

Manufacture of Vitamin A

The Vitamin A (Control) Order, 1941, has been revoked with effect from November 9, 1950, and vitamin A may now be manufactured and used for any purpose without a licence.

Soya Flour

The Soya Flour (Revocation) Order, 1950, which removes price control from soya flour and frees all manufacturers and prepackers from the need to be licensed, has been made.

The Soya Beans (Revocation) Order, 1950, which revokes the Soya Beans (Control) Order, 1948, has also been made. Soya beans and soya bean oil, however, continue to be controlled under the Oils and Fats (Number 2) Order, 1949.

Both revocation Orders came into force on November 5, 1950.

Imports of Canned Fruit

Canned fruit (other than mandarin oranges, apricots, peaches, pears, fruit cocktail, two fruits, fruit salad, grapefruit, grapes, and pineapple) may be imported from Belgium under block licences granted to individual traders. Limited quantities may also be imported from Denmark under specific licence.

The block licences will allow unrestricted quantities of canned fruit (other than the varieties listed above) to be imported from Belgium, provided that the national expenditure on such imports remains within the currency allowance authorised. In view of this proviso, it must be understood by all importers that it may be necessary to discontinue or suspend further imports without warning.

Traders wishing to share in these arrangements should submit an application (in duplicate) on Board of Trade Form ILD/A, which may be obtained from the Board of Trade, Import Licensing Branch, Romney House, Tufton Street, S.W.1, from usual Customs Offices, or from the Ministry of Food, Canned Fish, Fruit, and Vegetables Division, 89, York Terrace, N.W.1. For administrative convenience, importers are asked to send such applications to the Board of Trade through the Ministry of Food at the above address. In the case of Belgium, applicants will be required to give an undertaking that they will comply with certain conditions.

Information and Advice

Bakers' Piping Jelly

B.4719. *Please supply a recipe for the manufacture of piping jelly.* (Lanark.)

The following is a typical formula for piping jelly which may be used as a basis for experiment:

Gum tragacanth	2 lb.
Water	4 gal.
Glucose	40 lb.
Tartaric acid in 1 oz. of hot water	½ oz.
Essence and colour	*q.s.*

The gum is soaked in 2 gal. of water for twenty-four hours. After stirring well, the other 2 gal. of water are added and the whole is allowed to stand for another twenty-four hours. The acid is dissolved in the ounce of hot water and the gum is rubbed through a fine hair sieve into a steam-pan. The glucose is placed in another steam-pan and gently brought to the boil, stirring all the time. The hot glucose is added, stirred well, and brought to about 218° F. The whole is rubbed through a fine hair sieve, and the flavouring is added.

After cooling, the tins are filled and a paper disc that has been dipped in glycerin is placed on the top of each tin. A pint of glycerin can be added to piping jelly when boiling, which will assist in preventing mould growth.

Smoking of Salmon

B.4762. *Please supply us with details of smoking of salmon.* (Norfolk.)

The following details on the smoking of salmon are given as a basis for trial:

After the usual preparation of the salmon, it is salted in a tierce (fir or spruce barrel which holds about 800 lb. of fish), and the sides of salmon are carefully packed in it, layer upon layer, with a small quantity of salt between each, the process being continued until the tierce is full. In packing, the first sides are placed skin downwards, and the last skin upwards with an extra quantity of salt spread over the latter. From 85 to 100 lb. of salt are required for 800 lb. of salmon.

The tierce is headed up and pickle poured in through a plug hole until it is quite full. The pickle is made to a strength of at least 90 per cent. of fishery salt, and broken ice is added if the weather is warm. It should be strained before use to remove froth and settlement.

The tierces are placed in a cold store, where they are racked and kept at a temperature of from 35° to 38° F. They must be frequently examined and more pickle added if necessary. The tierces remain in cold storage for at least 20, but not more than 90, days.

The salmon sides are taken out of the tierces and soaked for 12 hours in tanks of water, the latter being changed several times in order to remove as much salt as possible. The sides are removed from the tank and the water thoroughly drained off. Each side is laid (flesh side down) and a bacon hanger is pressed firmly into the skin. The sides are afterwards hung up in a smoke-house in such a manner as not to touch each other.

Small fires of non-resinous wood (alder wood is generally preferred) are placed beneath and the ventilator of the smoke-house left open to allow moist air to escape. The heat from the fires must not be too great, as the object is to smoke the fish, not to cook them. For a mild cure, smoking from 8 to 10 hours is sufficient. For a harder cured salmon, smoking must be continued for two days. The ventilators of the house are partly closed and sawdust is placed on the fires, producing a dense smoke, which gives the required colour to the salmon. Care must be taken to see that no sweating of the fish occurs during the process.

Information Supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery, and materials, and also general information as follows:

B.4714. *Caramel.* (Australia.)

B.4716. *Peel cutting machinery, and orange peel slicing machine.* (Mexico.)

B.4717. *Meat presses.* (Yorks.)

B.4718. *Roasted and salted almonds.* (Glam.)

B.4720. *Utilisation of blackcurrants.* (Denmark.)

B.4721. *Processing of nuts, potato chip machine, peanut roasting machine, heat sealer for Cellophane bags, Cellophane bags, popcorn machinery, lollipop plant, toffee apple plant, apple peeling and coring machines, preparation of salted nuts, electric head splitters for pigs, continuous friers for potato crisps, and shelled nuts and stoned dates.* (Lanark.)

B.4723. *Canning of fruits and vegetables.* (S. Africa.)

B.4724. *Circular saw for meat bones.* (Devon.)

B.4727. *Trade mark registration.* (Durham.)

B.4728. *Candied peel.* (S. Australia.)

B.4732. *Liquid depositor.* (Bombay.)

B.4733. *Machine for spreading cream filling on wafer biscuits.* (London.)

B.4734. *Wrapping fruit and irregular shaped goods.* (Sweden.)

B.4737. *French mustard.* (London.)

B.4739. *Sugar substitutes.* (Worcs.)

B.4740. *Butter manufacturing machine.* (Kenya.)

B.4741. *Importers of cake mixtures and synthetic cream.* (Norway.)

B.4744. *Automatic coffee bean roasting machine.* (Australia.)

B.4745. *Nut blanching machine.* (London.)

B.4748. *Salad cream.* (Jerusalem.)

B.4749. *Automatic band ovens for bakeries, electric pressure cookers, automatic weighing machines for handling nuts, biscuit machinery, coffee roasting machines, drying plants for bananas, popcorn machinery, bread wrapping machine, and biscuit ovens.* (Holland.)

Information Required

B.4789. *Names and addresses of any British firms who can supply identity discs for use on metal retort baskets. Such tags are believed to be made from purple material or printed in purple; this colour changes to green only after prolonged exposure to moist heat, and is not affected by heat or adverse storage conditions.* (Lancs.)

Recent Patents

645,469. Sandell Precision Co., Ltd., and Barker, A. W.: Apparatus for the treatment of sweets.
645,677. Webb, J. A., and Burns, T.: Machines for printing or marking the surfaces of cans and other similar articles.
645,694. Bakovenbouw Voorheen H. P. Den Boer N. V.: Machines for squirting dough or doughy material on to a continuously moving conveyor.
645,729. Triggs, W. W. (National Bread Wrapping Machine Co.): Methods of and machines for applying labels.
645,746. Bradford and Sons, Ltd., S., and Foster, A.: Apparatus for greasing baking tins and like utensils, batches of dough, or paste preparatory to baking.
645,796. International Bottle Co., Ltd., and Maier, J. A.: Closures for bottles, tins, cartons, or the like.
645,806. Rowton, H. S.: Fish dressing machines.
645,842. Metal Box Co., Ltd., Bennett, H. J., and Bennett, J. M.: Dispensing containers for liquids.
645,858. Mabbott and Co., Ltd., Nelson, W. E., Jordan, N. S., and Haslam, R.: Vegetable cleaning machines.

Abstract of a Recent Specification

The Manufacture of Milk Sugar

This invention relates generally to processes for the manufacture of milk sugar or lactose from liquid whey.

Conventional processes for the manufacture of lactose from whey are carried out as follows: a portion of the protein of the whey is coagulated by addition of lime and application of heat, or by the addition of other coagulants, after which the coagulated solids together with precipitated calcium phosphate and other insoluble solids are removed by decantation, filtration, or centrifuging. The clarified effluent is then concentrated by evaporation, and lactose is crystallised from the concentrate. Lactose is then removed from the mother-liquor by centrifuging and further purified by washing. Processes of this character do not produce a lactose as pure as desired or as can be obtained by the present invention, and nutritive constituents of the whey solids, other than the recovered lactose, are seriously impaired or destroyed.

Some lactose has also been manufactured by crystallising from a concentrate of a lacteal material like skim milk, but without previous removal of proteins. In such a process, however, the proteins of the lacteal fluid are purposely held in solution or a state of colloidal dispersion and remain so during the recrystallisation of the lactose and its subsequent separation. The process has not proved satisfactory, the difficulties encountered being attributed to contamination of the crystals with protein.

In another process which has been used to some extent, the coagulable protein is not removed prior to crystallisation, but is enzymically degraded to molecularly smaller and less readily coagulable substances in order that crystallisation and subsequent operations may take place in a fluid relatively free from insoluble contaminants. Such a process is relatively expensive to carry out commercially, it is critical with respect to *p*H control, and it requires the addition of a chemical like hydrochloric acid, which is later neutralised.

Objects of the present invention are:

1. To provide a process making possible the manufacture of relatively pure lactose by crystallisation from a concentrate, without previous removal of coagulated proteins, and without any treatment to prevent the presence of coagulated protein or other insoluble contaminants during crystallisation.

2. To provide a process of the above character having a novel procedure for effectively separating out lactose crystals after the crystallising operation, and which minimises the percentage of contaminants removed with the crystals, and also minimises resolution of lactose.

3. To make possible the preparation of a relatively pure lactose by crystallisation from a lacteal concentrate to which no chemicals like mineral acid have been added.

4. To provide a process making possible the manufacture of milk sugar from raw whey, while at the same time affording a valuable food product from the remaining ingredients.

644,799. *Western Condensing Company.*

Recent patents have been selected from the "Official Journal of Patents" and are published by permission of the Controller of H.M.S.O.

Trade Marks

B & D.—664,241. Non-medicated sweetmeats and chocolates. **Barker and Dobson, Limited,** Frankling Place, Whitefield Road, Everton, Liverpool, 6; Manufacturers.

SUTTONS.—668,016. Capers, celery salt, curry powder, ginger, honey, chutney, sauces, cooking essences (other than essential oils), vinegar, and ketchup. **G. F. Sutton, Sons and Company, Limited,** Osborne Works, Brandon Road, Camden Town, London, N.7; Manufacturers.

COLONY CLUB.—672,617. Meat, meat products, and fish products, all for food for human use; fish, poultry, and game (other than live fish, poultry, or game); soups; preserved, dried, cooked, and frozen fruit and vegetables; and jellies (for food), jams, edible oils, edible fats, and pickles. **Bahama Food Products, Limited** (a Company incorporated and existing under the laws of the Bahama Islands), Buildings Nos. 316, 343, and 374, Oakes Field, Nassau, New Providence, Bahamas; Manufacturers and Merchants.

GOLDEN EAGLE.—676,594. Tea and coffee. **George Herron** and **David Craig,** trading as **Herron and Craig,** 77, North Street, Belfast, Northern Ireland; Merchants.

REGENT.—678,961. Colouring matters for food. **The London Essence Company, Limited,** 53, Glengall Road, Peckham, London, S.E.15; Manufacturers.

CAFFEX.—685,338. Coffee extracts for making beverages. **Bernard Lipton,** "Woodways," Albert Road, Leicester; Manufacturer.

ALMONDINA.—687,123. Chocolate containing almonds. **Fugistall, Limited,** Avondale Road, Cheadle Heath, Stockport, Cheshire; Manufacturers and Merchants.

Trade marks have been selected from the "Official Trade Marks Journal" and are published by permission of the Controller of H.M.S.O.

New Companies

Coombs Cakes, Limited. (486114.) 81, Northgate, Huddersfield. Nom. cap.: £2,000 in £1 shares. Dir.: H. L. Coombs, 297, Alder Street, Fartown, Huddersfield.

F. E. Tucker, Limited. (486364.) 89, Cornwall Street, Birmingham. To take over the business of a wholesale fruit and vegetable dealer carried on by F. E. Tucker as F. E. Tucker. Nom. cap.: £5,000 in £1 shares. Permt. dirs.: F. E. Tucker and Mrs. A. Tucker, 17, Wellington Road, Edgbaston, Birmingham; J. H. Lewis, 495, Warwick Road, Solihull.

Priory Farms (Essex), Limited. (486377.) To carry on business of fruit and vegetable growers, etc. Nom. cap.: £5,000 in £1 shares. Dirs.: H. Snowdon, Cotefield, Hathersage; K. G. Plews, 32, Eccleshall Road South, Sheffield.

Pember Products, Limited. (486419.) 12, Hillside Avenue, Wembley, Middlesex. To carry on business of manufacturers, distillers, producers of, and dealers in beer, wines, spirits, cider, mineral waters, etc. Nom. cap.: £100 in £1 shares. Dir.: R. Gold, 12, Hillside Avenue, Wembley, Middlesex.

Ripley Metalcraft, Limited. (486478.) Croft House, Derby Road, Ripley, Derbyshire. To carry on business of manufacturers of and dealers in metal containers, boxes, and canisters, etc. Nom. cap.: £8,000 in £1 shares. Permt. dirs.: L. N. Darbyshire, Woodclose, Woodfield Drive, Ripley, Derbyshire; A. E. Hawkins, 33, Oxford Street, Ripley, Derbyshire; A. Hughes, 416, Wilbraham Road, Chorlton-cum-Hardy, Manchester, 21.

Copper Kettle Preserves, Limited. (486491.) Chester Walk, Cheltenham Spa, Glos. To take over the business of a manufacturer of preserves and confectionery carried on at Cheltenham Spa as Copper Kettle Preserves by E. Marshall. Nom. cap.: £5,000 in £1 shares. Dirs.: E. Marshall and Edith A. Marshall, Pejoda, Pittville Circus Road, Cheltenham.

James I. Atkins, Limited. (486576.) The Factory, Berw Road, Pontypridd. To carry on business of manufacturers of and dealers in chocolates and confectionery, ice cream, etc. Nom. cap.: £40,000 in 20,000 preference shares of £1 and 80,000 ordinary shares of 5s. each. Dirs.: to be appointed by subs. Subs.: J. I. Atkins, Burn Brae, 74, The Parade, Pontypridd; V. I. Atkins, Bryn Berw, 78, The Parade, Pontypridd.

Mycrisps, Limited. (486582.) Bawtry Road, Bessacarr, Doncaster. To carry on business of producers and marketers of all classes of edible foods for human and animal consumption, especially potatoes and potato crisps, etc. Nom. cap.: £2,000 in £1 shares. Dirs.: S. Travis and Mrs. D. A. Travis, 52, Bawtry Road, Bessacarr, Doncaster.

Mead Holdings (Cornwall), Limited. (486612.) Mead House, Gulval, Penzance, Cornwall. To carry on business of manufacturers, sellers, or dealers in any article of drink or food; manufacturers of mead and beverages derived therefrom; coopers and bottlers, etc. Nom. cap.: £100 in £1 shares. Dirs.: Lt.-Col. G. R. Gayre, M.A., D.Sc., 21A, Chapel Street, Penzance; Mrs. L. Mann, Chycornik, Gulval, near Penzance; Major A. R. Cormack, F.C.A.; and B. B. Parry.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.

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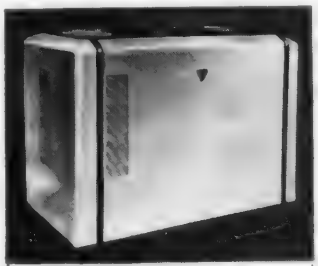

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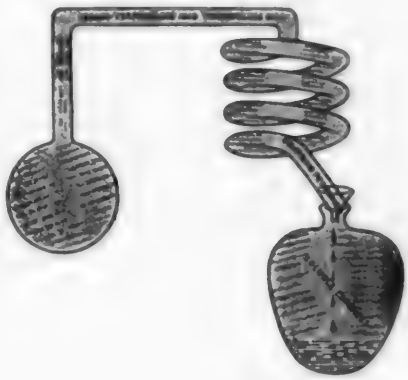

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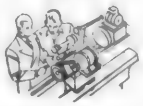

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And I with confidence might say,
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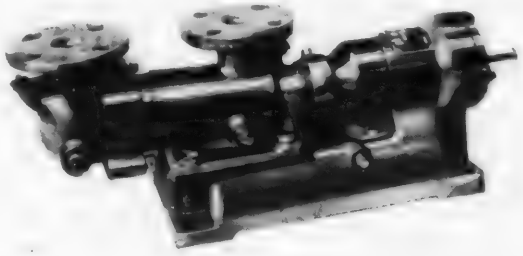

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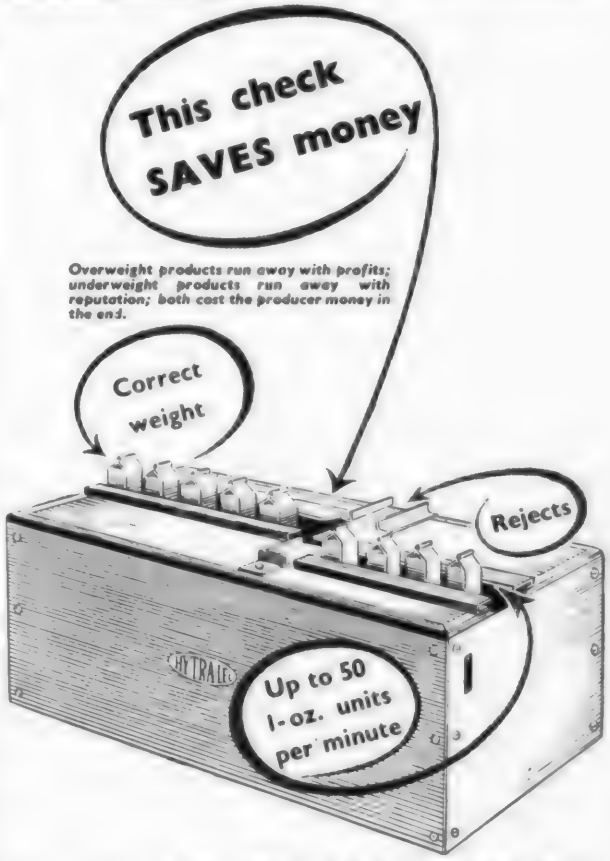
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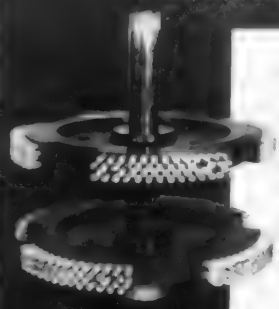

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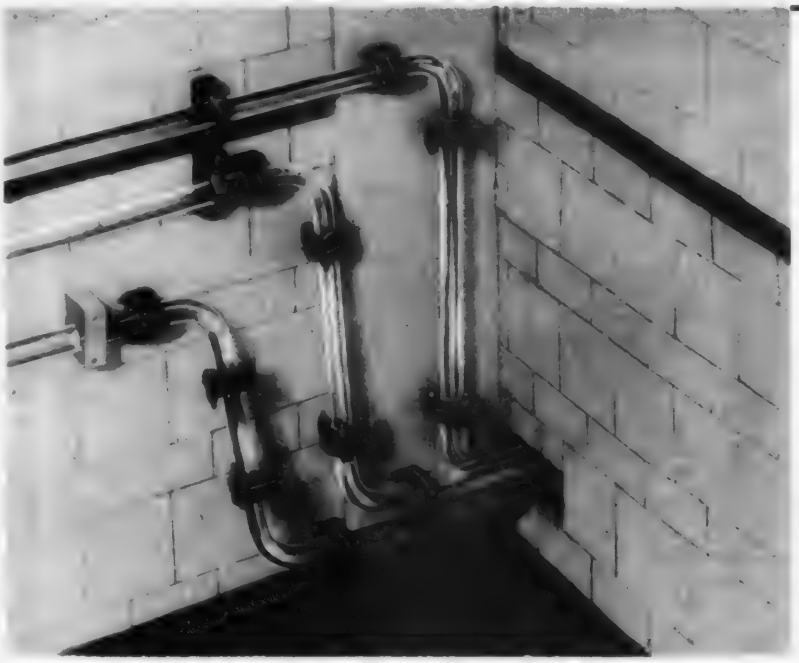

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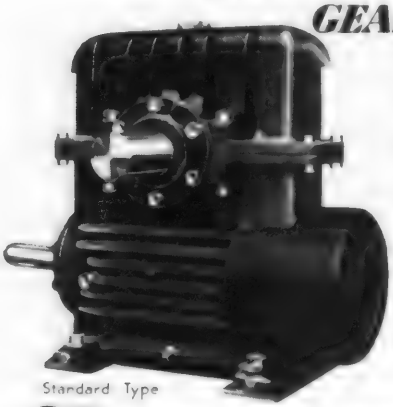

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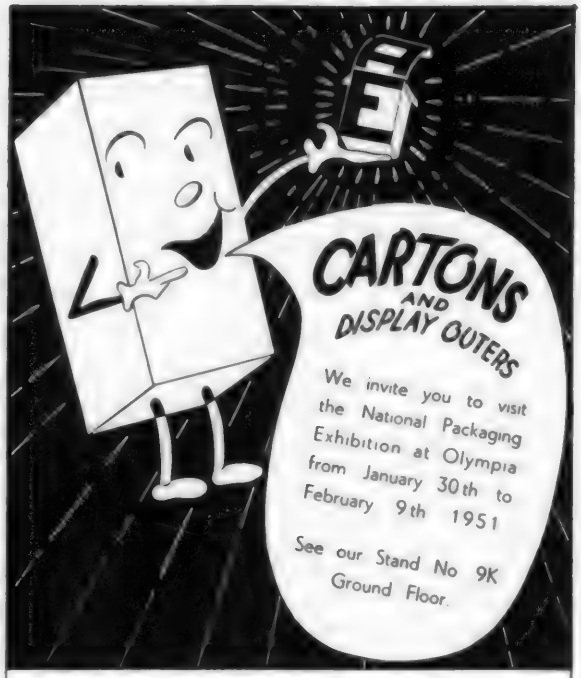
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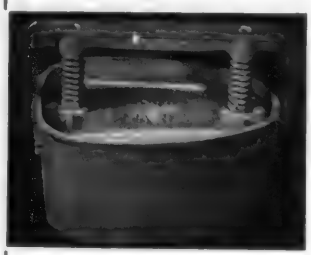

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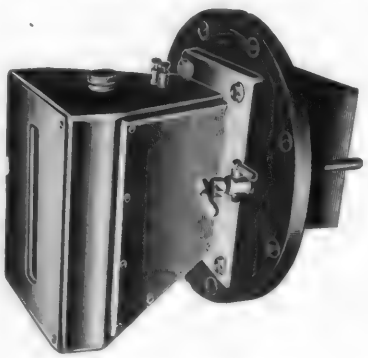

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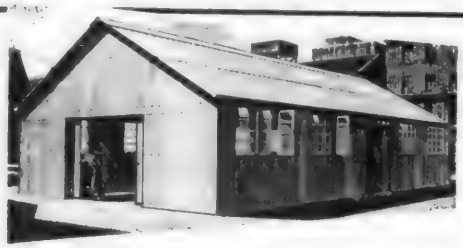

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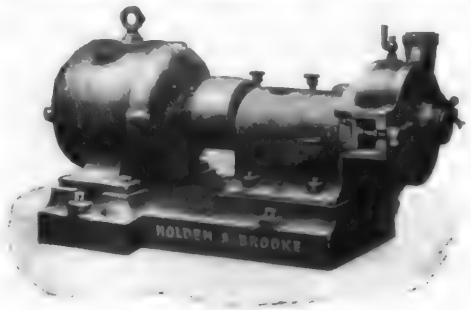

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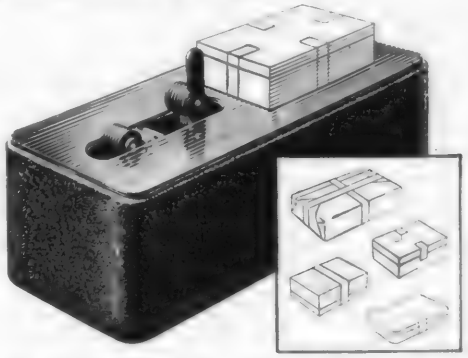

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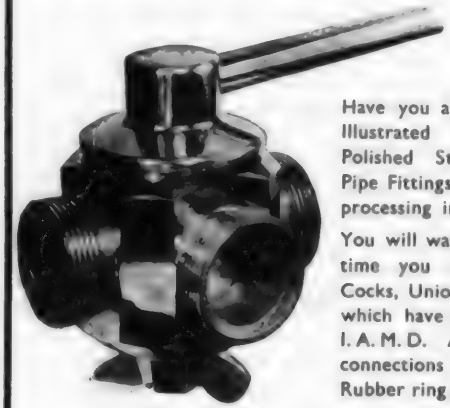

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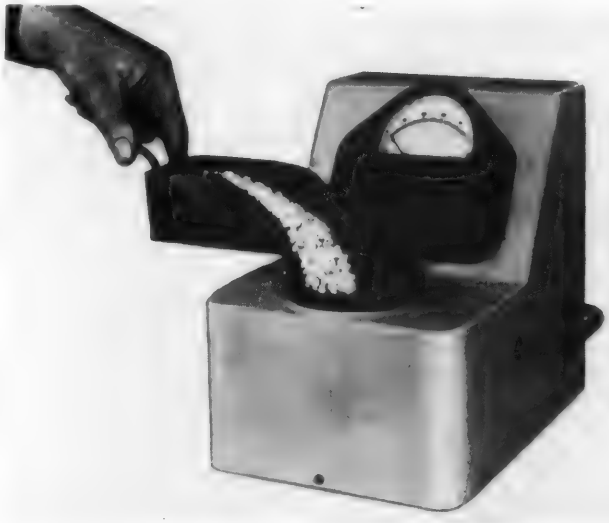

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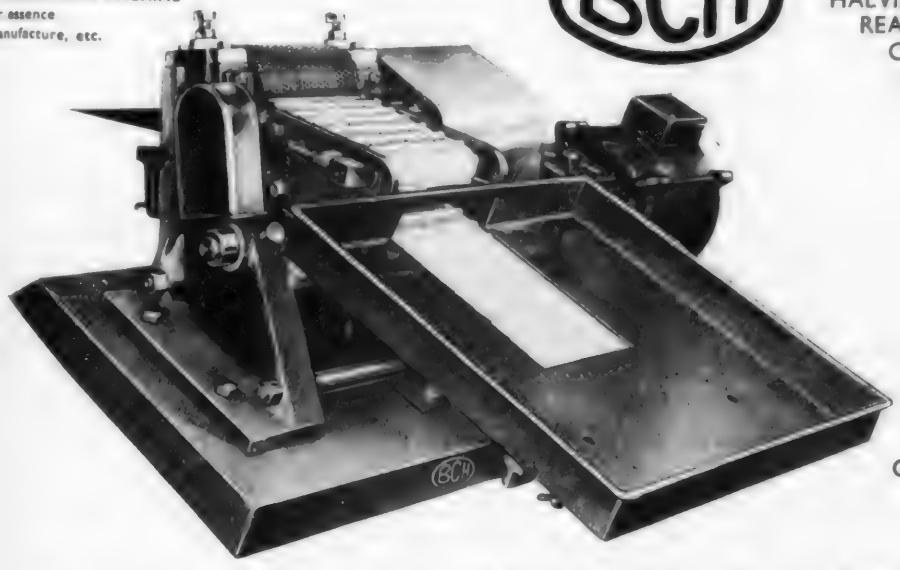

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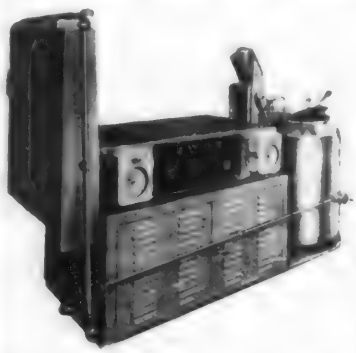

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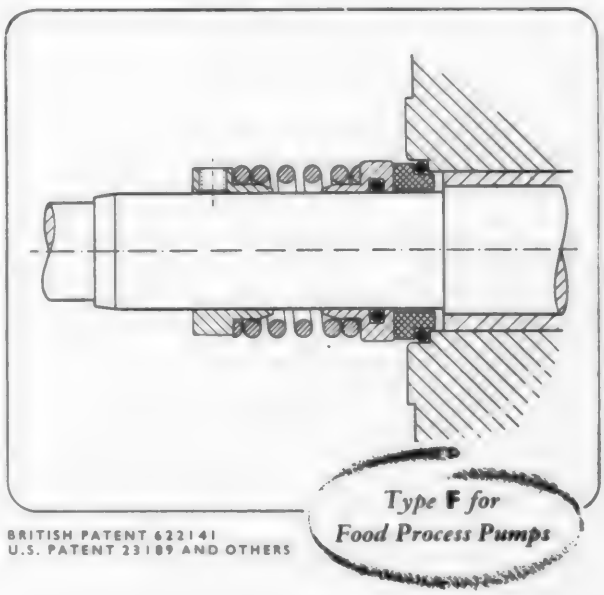

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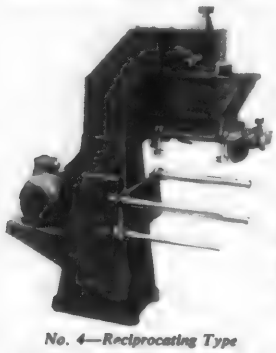

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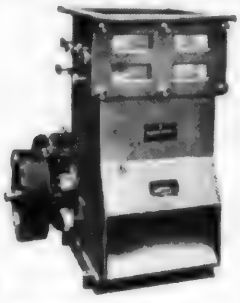

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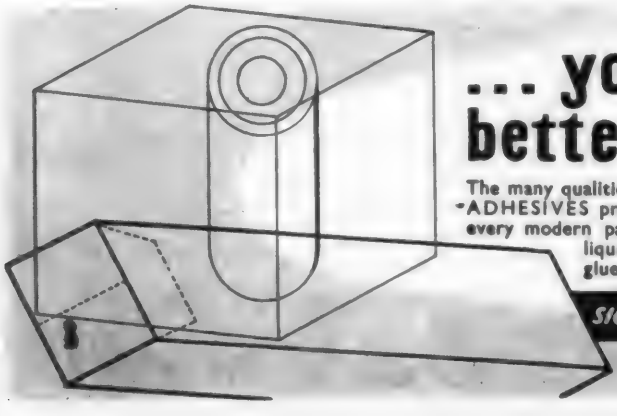

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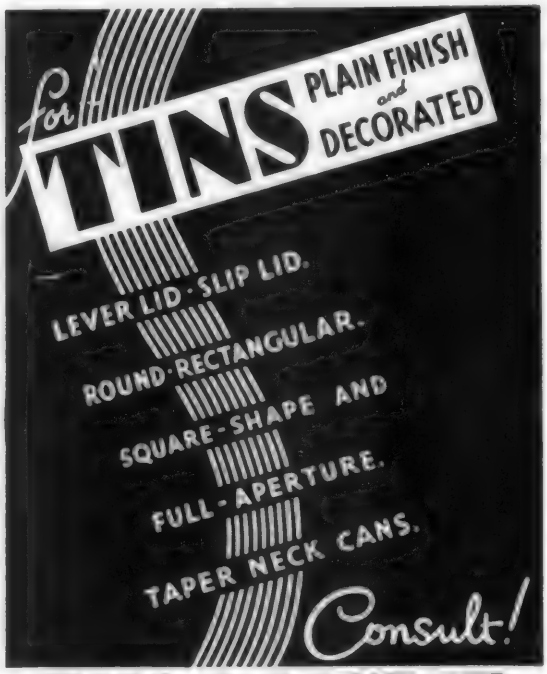

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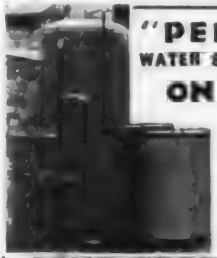

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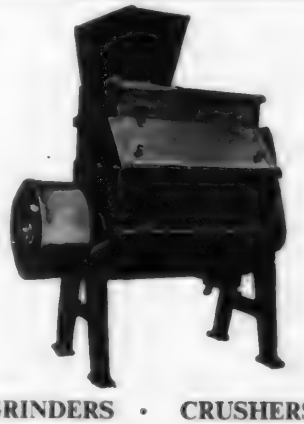

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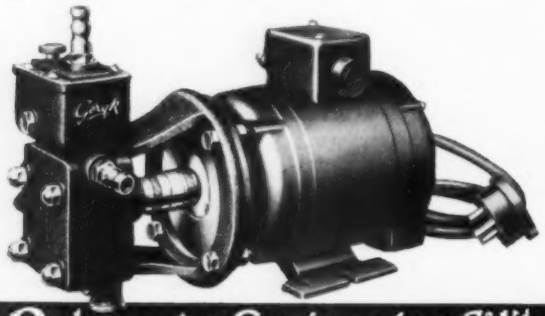

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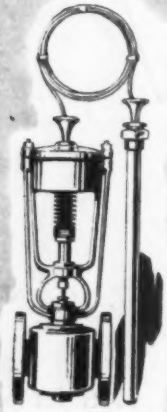

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by Billing and Sons Ltd., The London Printing Works, Guildford and Esher, England
Registered for Transmission to Canada including Newfoundland